BULLETIN

OF THE

AMERICAN GEOGRAPHICAL SOCIETY

Vol. XLIII 1911 No. 11

NORTHEASTERN CHEHKIANG, CHINA: NOTES ON HUMAN ADAPTATION TO ENVIRONMENT*

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GENERAL FEATURES. (Cf. map, Fig. 1.) Northeastern Chehkiang [Chekiang], a coastal portion of China, south of the mouth of the Yangtze River, is a district of subdued ranges and hills of irregular trends, which has been slightly submerged, thus producing a swarm of islands; and since then its inner waters have been converted into low plains and its landward islands bound together by the alluvial deposits of the Yangtze and other rivers, while the still detached outer islands, known as the Chusan Archipelago, have been cliffed by the sea.

BOUNDARIES. The district has fairly well defined limits. It is roughly rectangular, about 100 miles from east to west, by 50 miles from north to south. It is adjoined on the east and along a third of its northern coast, as far west as the mouth of the Ningpo River, by the Chusan Archipelago. West of the Ningpo River, as the shore bends around a northward salient, the sea narrows into Hangchow Bay. On the west the district is bounded by the north flowing Dzao-ngo [Yenki] River, on the south by the mountainous district of Sing-ts'ông [Sinchang], Dzing-yün and Vong-hwô [Feng-hwa].

* Although not in consonance with the standard system adopted by the Chinese Imperial Post Office the author's rendering of Chinese names has been retained throughout. It is based on local usage and not on the Mandarin, or official, dialect. Wherever possible, however, equivalents have been added in brackets.—ASST. ED.

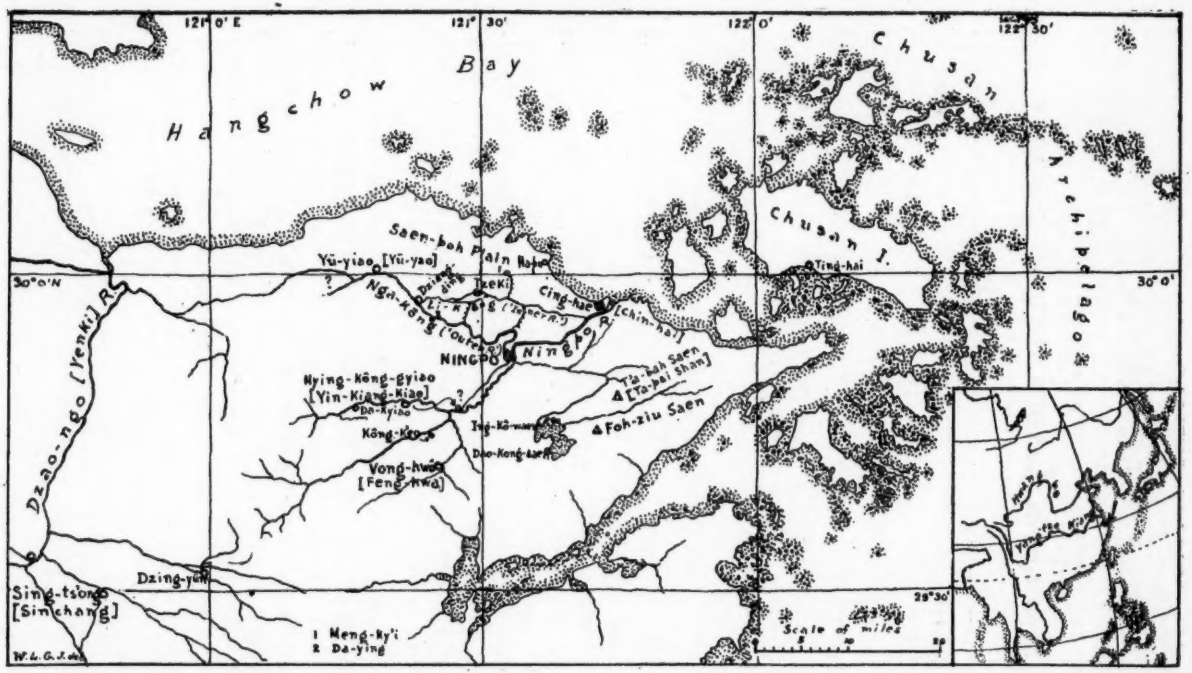

FIG. 1—Sketch Map of Northeastern Chehkiang, China. Scale 1:1,160,000 (1 in.=18.31 miles). Based mainly on the Karte von Ost-China, 1:1,000,000, published by the Prussian General Staff (1901–02), and, in part, on a map drawn by the author. Arrow on inset-map indicates general location of main map. Compiled by W. L. G. J.

Mountains, Plains and Rivers. The city of Ningpo lies on a large alluvial plain northeast of the center of the district, at the junction of large streams from the west and southwest whose united waters, forming the Ningpo River, flow northeastward and have the city of Cing-hae [Chin-hai] at their mouth. North of Ningpo and west of Cing-hae, there is the beginning of a range of hills on the coast. This narrow range varies in height up to about 1,500 ft. It continues in almost a straight line due west, broken only by a gap through which the western branch of the Ningpo River runs eastward. There the range turns southward till it is lost in a spur of the mountains of the interior. North of this range, bounded by the sea on the north and northeast and by the Dzao-ngo River on the west, is an alluvial plain called Saen-poh (=North of the Hills). South of the range is the Ningpo Plain. The latter is about 25 miles* in diameter, with the city of Ningpo near its center. It is the heart of the district.

East of the Ningpo Plain, toward the sea, there are again hills, which rise in the northeast to the peak of T'a-bah Saen [Ta-pai Shan] and, in the east, Foh-ziu Saen. These are about 2,000 feet high. They extend northeastward in a slender promontory. East of these hills the country is drained by small streams running directly to the sea; but most of the interior is drained by the Ningpo River. Its southern branch rises in the Vong-hwô hills and runs toward the northeast; the western branch (the Nga-kông [Yau-kiang]) rises in the canal system of the northern plain near the Dzao-ngo River† and flows east-southeast. These two branches join just outside of the Ningpo city walls. The Dzao-ngo, which bounds the district on the west, rises in the hills of Dzing-yün and Sing-t'sông and runs in a northerly direction to Hangchow Bay.

The Plains. It is evident, as stated above, that the plains of this district have been built up among former islands by silt brought down from the interior of China by the great river Yangtze and possibly to some extent by the Dzien-dang [Tsien-tang], near the mouth of which lies Hangchow. The southern mouth of the Yangtze opens in a southeasterly direction, giving a tendency to its waters to drift toward Ningpo. The water of Hangchow Bay and of the sea far beyond the islands is yellow and muddy, similar to that of the mouth of the Yangtze.

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* *li* ? (9 miles approx.).—Asst. Ed.

† This is not in accordance with the Karte von Ost-China (see legend of Fig. 1) on which the western branch of the Ningpo River is delineated as a watercourse connecting the lower Dzao-ngo with the Ningpo at the city of that name, thus making an island of the entire district lying north of it.—Asst. Ed.

The plains are literally level. The hills rise so abruptly from the plain that in many cases it would be possible to stand astride the line separating them, with one foot on the unquestionable hill slope and the other on the flat alluvium. Canals on the same level as the rivers often follow near the base of the hills. These canals receive the streams from the hills, yet their waters are quite clear, much more so than that of the flood tide that enters the large rivers from the sea.

Proofs that the action of silting is still going on are numerous. In Saen-poh (the northern plain) there are two villages at the foot of the narrow northern range, one called Tong-bu-deo (=Eastern Landing Stage), the other Si-bu-deo (=Western Landing Stage). The former of these is now about 10 miles* from the sea, the latter 14 or 15 miles†. Similarly, the name of the great city of Shanghai in Kiangsu Province means "On the Sea," but it is now inland. Some of the nearest islands in the Chusan Archipelago may be reached by wading at low water. The seashore is commonly a mud flat. At intervals the inhabitants have raised embankments to reclaim ground from the sea. This is known to have been going on for centuries. During the last six or seven years, at the large fishing village of Ha-pu, at the eastern end of the narrow northern range, the mud flat has been banked up and canals dug out, making an efficient harbor for the fishermen's boats.

The Coast and the Sea. The coast of the plains is low, flat and muddy; but where the hills reach the sea, as well as on the exposed sides of the outlying islands the coast is bold and rocky. The low coast of the plain lends itself very readily to the making of salt. Patches of mud flat are fenced in by embankments, so as to control the inflow of the tide. The sea water then passes in by rather irregular channels, in which most of the mud in suspension settles. It is then allowed to flow over the flat, where it evaporates. After a time a crust of salt forms. This is carefully scraped off and made into a strong muddy brine. The brine is filtered through straw in very primitive filters. It is then again evaporated on shallow wooden trays, and the coarse salt is scraped into baskets.

The sea abounds in fish and other marine animals. Among others may be mentioned several varieties of herring, pomfret and marine eels, together with dog fish, small soles, cuttle fish, clams, prawns, crabs, etc. The fishermen of Ningpo, *i. e.* of the whole Ningpo district, are noted for many miles along the coast for their

* *li* ? (3 miles approx.).—Asst. Ed. † *li* ? (5 miles approx.).—Asst. Ed.

skill. Their boats are made with primitive water-tight compartments. (It is said that the idea of water-tight compartments in modern steamships was first suggested by these boats.) In the summer they keep their fish fresh with ice and send them to the markets of Shanghai and Ningpo by frequent boats. At other times the fish are salted down, with salt procured in the islands, but made on the mainland. The empty shells of a small variety of clams are collected in the islands by boat-loads. These are taken to Ningpo and burnt for lime. A species of sea moss is gathered from rocky shores and eaten by the people. This is one of the numerous auxiliary foods, which the natives eat with their rice.

THE ISLANDS. The largest island in the archipelago is Chusan; it has several plains, three or four miles across, similar to those on the mainland; the sea water around it is muddy. Here the life resembles that about Ningpo: potatoes and other vegetables are produced in abundance; turkeys, geese, fowls and ducks are bred in large numbers. Most of the other islands are small, with few centers of population of more than 300 or 400 inhabitants; some of their people go to the mainland for harvest work, as if their islands were poor and uncultivated. On the outlying islands, cliffed on their exposed coasts, the people are notoriously piratical.

RIVER NAVIGATION. The native boats on the Ningpo River are made with flat bottoms. Shaped in this way they pass over the tidal water with little friction. The larger passenger and freight boats are generally dependent on the wind for their propulsion. When this fails, the boatmen have a large scull at the back, which feathers itself automatically, as it swings backwards and forwards on a pin at the stern. This scull is balanced so exactly that men can work for long periods without tiring. Sculling is not so rapid as sailing with a fair breeze, but as two men, by alternately resting, can keep up sculling for six or eight hours at a time, the distances thus covered are considerable.

Neither scull nor sail is as fast as the tide in the river when it is in full flow, the tidal range being five or six feet. For this reason almost all traveling on the river is done with a favorable tide. One of the most remarkable cases of adaptation in the district is found in connection with the Nga-kông, or western branch of the Ningpo, also called the "Outer River." The city of Yü-yiao [Yü-yao] is about 40 [25?] miles up this branch. This is too long a distance to travel on two tides, unless the wind is favorable.

About two-thirds of the distance to Yü-yiao at a place called Dziang-ding [Chang-ting], a tributary called the Li-kông, or "Inner River," bends back on the north side of the Nga-kông at an acute angle, so that the tributary flows about west. How much of the tributary is natural and adapted and how much is purely artifical, there are no means of knowing. About half way between Ningpo and Dziang-ding a small canal has been made, connecting the tributary with the Nga-kông. Entrance to this is by a *pô*, or haul-over, a Chinese substitute for a lock. Now, a boat leaving Ningpo on the westward flood tide up the Nga-kông finds itself near the haul-over by the time the tide is exhausted. The boat is then drawn over into the canal, which it follows to the tributary, in which it soon finds that the ebb tide is making a favorable current westward. By the time the boat reaches the tributary mouth, the tide has begun to rise again, and advantage can once more be taken of the flood current up the Nga-kông to reach Yü-yiao.

Connecting the Inner River with the Outer River there are two or three other cross canals. The first of these branches off from the Outer River about four miles from Ningpo. For about six months in the year the tide runs in and out of this at will, but in the spring the entrance is blocked up by an embankment. All boats passing in must then cross the haul-over. When this entrance is closed, the only connection with the tidal water is by way of the Inner River at Dziang-ding, a distance of 40 [20?] miles or more. After the first spring rains all the salt water is flushed out of this canal, and fresh water useful for irrigation takes its place. In hot dry summers, as the fresh water in the upper reaches of the river and in the Inner River is used up for irrigation and by its own evaporation, the salt water from the sea gradually passes up the Outer River till it sometimes reaches Dziang-ding. By blocking up its entrance the water in this canal is thus at least kept fresh for the whole of the irrigation season.

A bridge of boats crosses the Ningpo River from outside the Ling-gyiao Gate of Ningpo city to the east bank of the river, and another bridge of boats passes from outside the East Gate to the Foreign Settlement on the north bank. At other places the river is crossed by ferries. Smaller streams are crossed by bridges, some of which have fine arches, twenty or thirty feet above the water. The arches are reached by steps, such as one sees in Chinese pictures.

River Fishing. Advantage is taken of the tides and muddy water in the river to catch fish. Large pocket nets are held in place

by anchored boats. The fish blindly flow into them in the opaque water and are caught in large numbers.

Farther up the river another method of catching fish is used in several places. Pieces of bamboo are chosen long enough to reach to the bottom of the river and to rise one or more feet above the surface. Stones are tied tightly to these near the lower ends. They are then sunk and pushed into the mud. The pulsation of the water with the weight of the stones tends to drive the bamboos deeper, but the stones act as stops, so that they remain firmly anchored. As passing boats push these aside, their weight at the bottom and floating power at the top soon put them into position again. They are placed at intervals of two or three feet, so as to form a diagonal fence across the river. The fish, passing blindly along in the muddy water, are frightened by the vibration of the bamboos. In their endeavors to pass the barrier they swim along it to the side of the river, where they find a large square pull net rising and falling at intervals to catch them.

In many places along the banks of the river there are large stretches of reeds (*Phragmites*). These serve a double purpose. While growing they help to protect the banks of the river from encroachment by the flow of the tidal water. When cut they are made into the well-known reed sun blinds, with which verandas and many other places are protected from the blazing heat of the summer sun.

LAKES. There are several small lakes at the bases of the hills. These are generally held in by artificial embankments. They are useful as reservoirs for the canals. The most remarkable of them is situated about ten miles southeast of Ningpo City. There an irregular line of hills was found to almost enclose a large piece of the plain. Centuries ago some man with an engineering turn of mind saw the possibilities of the place. Six or seven pieces of dike were built, in all about a mile in length. The result has been the formation of a very shallow but exquisitely beautiful lake, standing about five feet above the plain. It is almost completely surrounded by hills, which rise at the highest to Foh-ziu Saen, referred to above. It is about six miles long and abounds in bays on every side, except along the straight dikes. The Chinese do not appreciate its beauty. This splendid body of water forms a reservoir to feed the canal system over a large area.

OFF-SHORE FISHERMEN. Curiously enough this lake is the home of the off-shore fishermen. They are a fine, hardy set of men with

a rough life full of hardship. Their fishing grounds are among the outer islands of the archipelago, where they go during the winter season of northwest winds, from October to May. Their rendezvous, when setting out, is in a large harbor in one of the outer islands, where thousands of pairs of boats, each carrying from seven to ten men, are gathered. In the summer, their large boats are drawn by manual labor up into the canals across the haul-overs, and from there into the higher water of the lake. Here during the summer months the boats are hauled ashore and repaired. The large villages of Dao-kong-saen, with a population of about 18,000, and Ing-kô-waen, with about 14,000 people, and several other villages on the shores of the lake are almost entirely inhabited by fishermen and their families.

CANALS. Looking on the plains from the top of one of the hills the most remarkable feature of the landscape is the canal system. How much of this has been made by the deepening of runnels of water and how much by direct design, it is difficult to determine. As will be shown later, the fact of a canal being crooked or straight is no guide to its origin.

The canals form a network in every part of the plains. They are the main roads of the district. Every village is placed near a canal. All heavy freight is carried on them by boats, and almost every village sends its one or more passenger boats on them daily, either to Ningpo, or to one of the main centers of population. As there are no wheeled vehicles anywhere in the district, the canal boats are indispensable for general traffic.

Mention has been made of the *pô,* or haulover,* as the Chinese substitute for a lock in passing from one level of water to another. These are built of solid blocks of stone in the form of a very obtuse-angled inverted A. About ten minutes is required for a crossing. In some places, notably on the banks of the Dzao-ngo River, buffaloes are used to haul the boats over, but in most places the work is done by a winch on each side, turned by men. Pieces of mud are cut out of the river side and, after being partly dried, are placed on the blocks of stone to lubricate the passage of the boats. In times of heavy rains or of very high tides, the water washes the mud away and makes the passage over a *pô* very uncomfortable. It is needless to point out that boats drawn over such back-breaking obstacles are subject to a heavy strain, and that only flat-bottomed boats could pass over them.

*Cf. illustration in É. Reclus: *Nouv. Géogr. Univ.*, Vol. VII (L'Asie Orientale), p. 589.—ASST. ED.

Large flocks of ducks are reared on the canals. Some flocks number more than a thousand. They are usually in charge of a "duck-herd" (Fig. 2), who takes them to the duck-house at night, where they lay their eggs. In addition to taking general care of his flock and feeding them, the duck-herd watches for the ducks who lay their eggs during the day: these delinquents are killed and eaten.

FIG. 2—"Duck-herd" with ducks.

FISHING IN THE CANALS. The canals supply a great many fish and other edibles for the Chinese table. Several varieties of carp and bream, eels and marsh tortoises are the most common. A Chinese proverbial expression for fine eating is "Fresh bream and sliced pork dumplings."

Much of the fishing is done by nets. Other methods, however, are employed. The laying of baited hooks to catch some kinds is common. One of the strange sights in the canals is that of catching fish by trained cormorants. These birds sit solemnly on the edge of the boat with rings round their necks to prevent them from swallowing the fish. Suddenly the fisherman begins to shout to them and with a long bamboo brushes them all off into the water. Then a lively scene ensues. The man continues to shout and beat the water with his bamboo, while the birds dive for fish. They come up and endeavor to swallow their prey. When the man sees a bird with a fish half swallowed, he puts his bamboo under it and jerks it up into the boat. There he compels it to disgorge into a basket and then tosses it back into the water. After the birds have finished their work they are fed on the offal and smaller fish.

Dredging the Canals. The natural tendency of the canals is to silt up with mud. The farmer, however, finds that this mud is most useful to help enrich the soil of his fields. The dredger he uses is a very simple one. Two pieces of bamboo tied together in the form of scissors and, at the ends of these poles, two bamboo baskets fitting closely together like a bivalve shell complete his outfit. The thin slush is gathered into boats in the winter. From the boats it is scooped up on the fields near the canals. There it dries in the sun, and in the spring the men cut it up and spread it over the fields.

Another use for this mud is to make bricks and tiles. It is first dried, then moistened to a proper consistency, molded into bricks or tiles, partly dried in the sun and then baked. The gray bricks thus made are very hard and resist the action of the weather for a long time.

A further use is made of this mud as a substitute for mortar in the building of sheds and the poorer class of houses. A good substitute for cement is made of mud, sand and lime. This cement dries slowly, but when it is set, it becomes very hard. The sand comes from the village of Nying-kông-gyiao (mentioned below) in this district and the lime from other hills.

Irrigation. The Chinese are noted everywhere as past masters of the science of irrigation. Nowhere can this be better seen than in northeastern Chehkiang. The use of the canals as reservoirs for irrigating the fields is even greater than for the purpose of transport. In very dry summer weather the water is pumped out on the fields till the canals are emptied. Traffic must then fare as best it can.

As the staple crop on the plains is rice, a constant supply of water is essential. The water is pumped on to the fields by chain pumps made entirely of wood. In some places men use a treadmill to drive the pumps, but more commonly the work is done by the patient ox. This and ploughing are the two principal employments for oxen in the district. For the best rice crops the fields should be kept under two or three inches of water all through the season. To keep this level water must be pumped daily except when there is rain.

Streams in the Hills. The supply of water in the canals in most cases comes partly from mountain streams. Some of these flow with rapids and cascades in ravines; others on pebbly beds in flood plains. Much of the water in these streams is deflected from the main course for irrigation purposes. These subsidiary channels are found near the courses of all these streams, channels that can be drawn from at will.

In some of the larger mountain streams the water is used to turn simple pulp pounding mills, where bamboo is prepared and made into coarse wrapping paper.

One of the largest of these streams enters the canal system at Nying-kông-gyiao [Yin-kiang-kiao], a large market town about 20 [8 or 14?] miles south [S. W.] of Ningpo.* From here to the village of Da-kyiao, a distance of about 10 miles up the stream, boats of very light draft and bamboo rafts are used. The pebbles in the bed of the stream are arranged to form dams at intervals, and the rapids are gathered into narrow channels, thus giving enough depth of water for the boats and bamboo rafts.

THE HILLS. The ridges of many of the hills have very poor soil, composed of half decayed rocks. Outcropping ledges are rare. On some there is a fair growth of grass, but on many of them nothing will grow but stunted pines. On other hills very coarse grass and brushwood may be found. All these are used for firewood. People of western lands will probably be astonished to hear that the Chinese name for the azalea is "firewood flower." Hill sides that are perfect flower gardens of white roses and white, pink and yellow azaleas in the spring, are ruthlessly stripped to supply kitchen fires in the winter.

In the hollows of the hills the soil is better. Here the farmers make terraces for rice fields, and the water of the hill side springs is carefully guided in channels from field to field for irrigation.

In the damp ground at the bases of the hills the soil is used for groves of bamboo. The uses of bamboo will be noticed later.

QUARRIES AND STONE WORK. At Nying-kông-gyiao, at Da-ying, on the western branch of the Ningpo River, and on some of the islands off the coast, there are large stone quarries. The stone is unusually hard and tenacious. The common form of bridge over nearly all canals has a span composed of long slabs of stone. (Fig. 3.) The slabs are nine or ten feet long and only four or five inches thick. They are upheld only at the ends. Only the hardest of stone would bear all its own weight and the weight of heavy loads passing over it.

The foundations of all walls are composed of this stone. The damp, muddy soil within three or four feet of high water level, would soon rot bricks or wood. Chinese houses in northeastern Chehkiang are built so that the heavy tile roofs depend upon the

* On the Karte von Ost-China, 1:1,000,000, it lies about 6 miles farther west than indicated on the author's map.—ASST. ED.

support of wooden posts, the walls being built after the frame and roof have been finished. White ants abound in many places. To prevent their ravages, in all important buildings each post stands on a round stone foundation raised from the floor. In some of the rest-sheds on the sides of the roads each post is composed of one long single stone.

In country places at irregular intervals and in the villages closer together, there are stone landing-steps leading down to the canals

FIG. 3—Bridge showing span composed of long slabs of stone. Si-hu, or West Lake, west of Hangchow, in the background.

where the women wash their clothes, rice and other things. Stone flood gates for use in time of heavy rains are to be found in all the canals.

The city walls of all large cities are built of huge blocks of stone, ten or fifteen feet thick. These are so substantially built that even modern artillery can do very little to destroy them. This was shown in the China-Japan War and in the Boxer Troubles.

All main "dry roads" of any importance are built of stone. In most cases these roads are only four to eight feet wide and are simply composed of slabs of rough stone one to three feet wide in a single row, bordered by bare earth. In addition to the durable nature of the material, a great advantage is gained from the general dryness of the stone slabs. They are always raised up above the

rice fields, and water runs off the stones at once. One disadvantage is that when slightly damp the stones become very slippery. In this the Chinese shoe with a yielding cotton sole is found much more secure to the step than the foreign shoe with raised heel and nails.

Stone is used for building graves. These are all above the level of the ground. In many cases one or two plain slabs of stone are laid as a foundation for the coffin, the sides are built just large enough to contain it, and the roof is made of the same material, with runnels for water, so that the coffin may be kept perfectly dry. Lastly, stone is used for mill stones and for hulling rice. In both these cases the mechanism employed is exceedingly simple, but without illustrations it is difficult to describe it.

Chalk is found in some of the hills and is made into lime, but the best lime for house building is imported from Fu-yang on the Hangchow [Tsien-tang] River. Another use, however, is made of this chalk. It is pounded up very fine and the white powder is used by women as powder for their faces. In a little coarser form it is mixed in with rice to make it white and attractive. For this reason all rice needs to be washed before it is cooked.

Soil of the Plains. The muddy soil of the plains is exceedingly rich. Its depth has never been fathomed. At the city of Shanghai, which is situated on a neighboring plain where the conditions are similar to those of northeastern Chehkiang, borings have been made 500 feet deep, but no rock has been found. If the surface soil is taken off for any purpose, as, for instance, in piling a mound on the top of a grave, a little manure will soon make the stripped surface fruitful. All of the fecal matter of the centers of population is used to fertilize the soil. This is one cause of the unenviable reputation China has for foul smells.

Owing to the general irrigation of the fields and to the narrowness of the roads, there is usually no dust to be raised by the winds. But about once a year there is a "dust storm;" the lower air is usually quiet, but the sky is hazy, and everything becomes covered with dust, the source of which is probably the dry plains of Mongolia.

Reference has been made to the use of mud dredged from the canals in making tiles and bricks. In the village of Kông-k'eo, at the foot of the Vong-hwô hills, there is a large pottery of earth dug near the hill side. At this place huge earthen jars are made capable of containing about a hogshead. These jars are used for collecting rain water, and they may be found in every household. Smaller jars of similar shape are made for various household and other

uses. Wine jars and rough earthen bowls are also made there of the same material.

WATER AND ICE. With the exception of coolies, who sometimes drink water from the canals in their hands, no Chinese drinks anything but hot tea. A doctor once remarked: "The only salvation of the Chinese is that everything they eat and drink is boiled."

In some places, especially along the side of the Ningpo River below the city, there are large ice sheds. The canals seldom freeze, but during the winter the rice fields are flooded, and the ice, a quarter or half an inch thick, is gathered after each sharp frost. This ice is used for keeping fish fresh, especially in hot weather, and for other purposes. It is unnecessary to add that it is quite unsafe to put it into anything which is to be cooled for immediate consumption, as it is loaded with germs of disease.

ANIMALS. The fauna of northeastern Chehkiang is abundant, but in some cases the animals are not put to use as they might be. Oxen are used for the purpose of ploughing, also for turning the chain pumps for irrigation and on some of the haul-overs. A striking feature in many fields is that of ploughing with the patient water buffalo. (Fig. 4.) These huge but mild animals are also used for turning the irrigation pumps, for turning rice hulling and grinding mills and for various other purposes where great strength is needed.

Ponies and donkeys are also to be found in this district, but they are used for carrying persons only. There are no wheeled vehicles, and loads are either carried by boats, or on the shoulders of porters. Dogs and cats are abundant, so also are rats. No attention is paid to the breeding of dogs, and all pups that are born are allowed to live. The result is that the only variety is a medium sized creature with a sharp nose, and as a rule, quite destitute of courage or intelligence. The dogs of a Chinese city are scavengers of the vilest type.

Goats are bred in small numbers and are used as food. The ordinary goat-mutton is a combination of bones and leather. The skin is not stripped from the flesh, but the hair is shaved off. The amount of meat between the bones and skin is exceedingly small, and the taste is poor. Hogs are bred in large numbers, but no care is taken in the selection of the best varieties. The flesh is so generally eaten by the people that the word translated "meat," when used with no qualification, means pork. The skins are cured in such a way as to remain white. Thin boxes are made of camphor

wood, and pigskin is stretched over them. This is the box commonly used for storing clothes. It might be added that pigs are the rivals of dogs as the filthy scavengers of Chinese cities. If the buyers of pork, now sent from China to the London markets, could see the foul creatures whose flesh they are eating, possibly they would choose some other kind of food.

A small variety of deer, resembling a fallow deer, with a white belly and large white spots, is found in the hill districts. The flesh of this is used for food and the skin for various purposes.

In the winter the lakes and larger waterways abound with wild ducks and geese, and on the hill sides there are large numbers of pheasants and wild pigeons. Many of the pheasants and pigeons

FIG. 4—Ploughing with water buffalo.

are shot and brought to market, but the proverbial shyness of the water birds makes it exceedingly difficult for the Chinese with their primitive firearms to kill them.

Reference has been made to the flocks of tame ducks on the canals and the use made of them. Fowls, too, are bred in large numbers. The true home of the celebrated "Shanghai Fowls" is Lang-shan, on the Yang-tze River, but a similar and equally fine breed is cultivated in the island of Chusan, the largest member of the archipelago off northeastern Chehkiang. Fowls' eggs in the ordinary form are eaten on certain periodical feast days, and the fowls themselves are generally eaten at the New Year season. Fowls' eggs are preserved in a specially prepared mud made of gravel, lime and salt. They are kept in this till the whites take on a

greenish hue. They are then boiled hard and are considered a great delicacy at feasts.

In the swampy fields frogs abound. They are called by the natives "field fowls." The legs of these are eaten as delicacies, but the mandarins do not allow the frogs to be caught till after the rice has passed the bloom, as they are supposed to eat destructive insects.

Crops. With a semi-tropical climate and rich soil the ground produces abundantly all the year round. On quite a large proportion of the fields two crops a year are regularly raised. Wheat is harvested in June. Early in the year late rice is sown very thickly in small patches, and it comes up like grass in a meadow. As soon as the wheat is harvested, the ground is at once flooded, ploughed and manured, and then the rice, by this time five or six inches high, is planted out by hand in clumps of three or four stalks in even rows. As the stalks are drawn out of the mud, the whole root comes with it, and, when planted again in mud, it revives at once. This crop of late rice is harvested in November. Early rice is alternated with cabbages and late winter vegetables.

The soil and climate are both suited for growing cotton. The plain of Saen-poh is celebrated for this. Cotton wool is used for padding clothes in the cold weather. As it is non-absorbent, these garments are useful in wet weather as waterproofs. It is also used for padding large bed quilts. These are used in the place of mattresses, blankets, sheets and all other bedding. Until the last few years the underclothes of all classes and the outer clothes also of the lower classes were made of cotton. Spinning and weaving have been carried on by the simplest machinery, but native cloth is fast being superseded by that from foreign cotton mills. The shoes with cotton cloth bottoms, referred to above as preventing one's slipping on wet stone roads, absorb moisture and are wet through almost instantly in wet weather. It is worth while mentioning that the native pattern of socks is made with two layers of thin material, and for this reason they are proof against mosquito bites.

Corn, peanuts, sweet potatoes, beans and other crops are grown, also a very poor kind of turnips. Beans are made into bean curd, a favorite dish with the poorer people. Chinese soy, the principal ingredient in various sauces and "relishes," is extracted from beans. Vermicelli, too, is made from bean flour. A cooking oil is extracted from peanuts. Some of the cabbages are partly salted down and left to ferment. This also is a common "flavoring material' for the rice of the lower classes.

In the spring the plains are bright with yellow patches of *yiu-ts'ae,* a kind of rape. The oil made from this is used for all kinds of cooking purposes and for dressing the hair.

Another crop for which the swampy fields are well suited is that of rushes. These are regularly cultivated. They are then in exceedingly primitive looms made into mats. These mats are used to wrap round bedding and in the hot summer weather are very cool to sleep on. Some of the better qualities are dyed and made into the Chinese matting which is so well known in western lands.

In some of the fields a variety of water chestnut (*Eleocharis tuberosus*) is grown. The fruit is rather wooden and tasteless, but large numbers are sold in the streets. Chinese taste differs from that of foreigners from the West.

Indigo is grown in the district and is used for the dyeing of clothes. Blue is by far the commonest color for Chinese clothes.

TEA. On every hill side, where the soil is suitable, tea is cultivated. These precious leaves are grown on small stunted bushes. The Chinese for their own taste simply dry the leaves and, when they make the tea, use boiling, or nearly boiling, water. In preparing what is known as "red tea," the tea which foreigners use, the leaves when half dry are bruised sometimes between the toes of men. Details had better be left untold, lest the taste of China tea should be spoiled to the reader.

TREES. Although China is said to be denuded of her forests, trees form one of the leading features of every landscape in northeastern Chehkiang. On the hill sides some of these are self-sown, but on the plains and in specially selected spots on the lower hills some care is shown in planting suitable trees. A common variety of soft pine is grown for ordinary timber. Another variety of strongly resinous pine is found to be almost impervious to the ravages of white ants and for this reason is used in better houses.

Magnificent camphor trees in very many places beautify the landscape, especially when the bright young leaves appear in the spring. The native workmen make boxes and furniture of this wood. Clothes packed in camphor wood boxes and drawers are protected from the moth.

A variety of white maple is also grown. This wood has very little grain and is suitable for carving. Ningpo carvers are noted in every part of the world for their beautiful work in this wood. They make photograph frames, boxes, large and small figures, besides large furniture, and ship them everywhere.

The *Chamaerops,* a variety of gomuti palm, flourishes in some parts, especially in the narrow valleys and at the base of the hills. The fiber round the trunk of this tree is non-absorbent of water. The country people use it for making rain-coats. Boatmen and others use it for making ropes, which do not rot with constant immersion so quickly as hempen rope would. The fiber is also used for making mats for the outside covers of Chinese traveling bedding: it is here found to be doubly useful, for, in addition to keeping the bedding dry outdoors, it serves indoors, when spread under the other bedding, as a protection against bed bugs, for these insects will not crawl on it. In a country where the people do not often wash themselves or their clothing, or clean their furniture, such an insulation is an invaluable aid in procuring a night's rest. A thinner cord made from the palm fiber is used, stretched on a frame, to make a slightly yielding bed spring.

In some districts there are large tracts of mulberry trees, grown exclusively for food for silk worms. The quality of the silk produced is not so rich as that made in the Hangchow and Soochow districts, but the industry provides employment for a large number of people.

The inferior growths of all trees are used for firewood. Large quantities of charcoal are made in the hills. As there is no coal within a long distance, the gathering of firewood and the manufacture of charcoal are most important industries.

Although they are not indigenous to northeastern Chehkiang, mention might be made here of two other varieties of trees. One is a very beautiful tree known as the "Maiden Hair Fern Tree," with leaves similar in shape to those of the maiden hair fern. It has been advertised in England by a well-known firm as "no longer indigenous in any part of the world." It grows a little distance west of the district under consideration, in the upper reaches of the Dzien-dang, or Hangchow River, and is one of the commonest trees to be found there.

The other tree grows in the district surrounding the city of Hwei-chow, in the neighboring province of An-hwei. It is that from which the celebrated "Ningpo varnish" is made. The secret of preparation of this varnish is held in a certain clan. As a covering for wood it is unrivaled. The surface is bright and dries extremely hard in damp weather. When it is dry, boiling water does not injure its surface. It thus makes a much better surface for tables than French polish. The Ningpo workmen have made it

famous, as the commonly accepted name shows, although the principal ingredients are produced elsewhere.

With regard to flowering trees mention might be made of a species grown in the district, which is called the *lah-me hwô*. It bears a bright yellow flower in winter, when there are no leaves on the tree. Another tree is called the *kwe hwô*. It is an evergreen and produces flowers in the autumn. These flowers are very fragrant and are much prized by the natives.

The fruit trees are varied, as might be expected in a district which lies between the heat of the tropics and the cooler latitudes of the north. In the neighborhood of the small city of Koh-gyii, which lies under the shelter of the Ningpo promontory, small oranges are grown. In the same place and in many of the narrow valleys between the eastern mountains, the natives grow large numbers of very small oranges, about the size of marbles. These oranges are commonly eaten in their skins. They are used, too, to make delicious preserves.

Pears, plums, apricots, and apricots with flattened ends are also grown in the district. To a visitor from western lands these fruits do not seem to have the same flavor as those common at home, but the natives eat them in large numbers.

A fruit that is much prized by the Chinese is called the *laen-dzô*. This is a sour red fruit about the size of a cherry, a variety of hawthorn (*Crataegus cancata*). It makes a delicious preserve, but the most popular way of preparing it is in the form of a red jelly. This is one of the commonest forms of sweetmeat put upon the table for a casual visitor's refreshment.

Another popular fruit in its season is the Chinese medlar (*Eriobotrya japonica*), called the *bibo*, or in Canton, the *loquat*.

Perhaps the most delicious edible fruit in the district is the *yiang-me*, or tree shrubbery. This is the *Myrica*, a fruit similar to the arbutus. It is very much prized by the natives, and during the season is eaten by all classes of the people.

Another useful, but not edible, fruit is that of the *gyiu-jii*, or tallow tree (*Excoecaria* [*Stillingia*] *sebifera*). Candles are made from the covering of the seed of this tree, and oil, extracted from the seeds by pressure, is used in lamps and for cooking.

Bamboo. Turning from other vegetables and trees to the gigantic grass called "bamboo," we find that it affords the most striking series of adaptations in this district, or in any part of China. The character of the Mongolian Race has been compared to their great

plant, the bamboo; yielding to pressure from without, but returning to its original position as soon as pressure is removed.

Bamboo groves are cultivated with great care. A certain proportion of the growth is removed each year, either in the form of shoots, or as full grown bamboos. These are not removed at random, but in such a way as to encourage the fullest growth on a given piece of ground. Bamboo is difficult to transplant, but when it has once taken root, it will spread in all directions.

In addition to furnishing the plain "stick" of bamboo, it is prepared for use in various ways. One way is to push a long rod through the hollow core and break out all the diaphragms of the nodes, thus making it into a single continuous cylinder. Another is

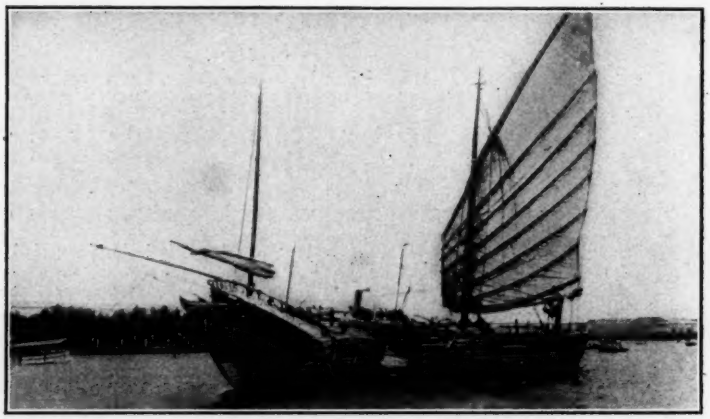

FIG. 5—Chinese junk showing sticks of bamboo used to flatten the sail.

to split it diametrically into sections and, after knocking away the broken parts of the diaphragms, to split the sections parallel to the circumference into strips, called by the Chinese *mih*. The strips vary in width from about three-quarters of an inch downwards, the thickness being about one-eighth of an inch. The outer or surface strips and those next adjoining are very strong and pliable and can be manipulated in numberless ways.

Fishermen and boatmen use the bamboo in every part of their work. In nearly all but the largest boats a heavy bamboo of the *mao-coh* variety is used as a mast. On the sails at intervals of every foot or two sticks of bamboo are fastened to flatten the sail. (Fig. 5.) For this reason the Chinese junk can sail closer to the

wind than any other boat known. The deep-sea fisherman uses pieces of bamboo as floats for his net. A common form of net used on the banks of the canals is square, kept in shape by four pieces of bamboo. Another piece of bamboo is fastened to the middle of this and forms the arm which is raised and lowered by a piece of rope.

In addition to the fish fence used in the tidal river (described above), another form of fish fence is used in the canals. This is made of split bamboo placed so closely that a fish could not pass through. At each fence one or two wide passages gradually grow narrower and wind into an inner enclosed space. This acts as a trap.

On passenger boats the boat hook is made of a long piece of bamboo with a hook at the larger end. The roof or cover of the

FIG. 6—House made of bamboo matting.

boat is made of bamboo used in three ways. A strong frame is made of heavy bamboo split into about four sections. Two mats are formed of interlaced *mih,* or strips of bamboo, and between these there is a thatch of large leaves taken from a dwarf variety of bamboo. This cover is strong and flexible and can be put up or taken down very easily. (For bamboo similarly used in house-building see Fig. 6.)

The strong rope, which is used to pull the boats over the *pô,* is generally made of the inferior inner strips of *mih.*

The bamboo rafts used on the mountain streams are made of large bamboos laid side by side in one layer. The smaller ends are

scorched over fire and turned up to form the bow of the raft, so that it may glide over stones in the path.

Almost without exception every tradesman adapts bamboo to some purpose or other. The cooper uses twisted split bamboo to bind his tubs and buckets. The carpenter uses large bamboo for roof beams in some small houses. He also uses pins of bamboo in joining together boards to make a smooth surface, and in many places where a Western carpenter would use an iron nail, he uses a bamboo "nail." The farmer uses a bamboo dredger for getting mud out of the canals for his fields. He uses a stick of bamboo for the handle of his digging hoe and rake, and for a light rake used for gathering straw together he has a bamboo stick split at the ends to form the teeth of the rake. Rice is threshed out in the field by hand, and a mat of *mih* protects the flying grain from scattering into the field. To winnow the chaff from the grain it is passed through a bamboo sieve in a place where the wind is blowing. A large mat of *mih* is used for drying the grains of rice, and a similar mat is used for protection from sun and rain in all sorts of places. This kind of mat, covered with tar, is used, too, under the tiles of roofs. If the farmer needs to make a fence anywhere, he makes it of interlaced pieces of split bamboo. The Ningpo version of the New Testament in St. Luke 14.23. reads "You go out on the big roads and by the sides of the bamboo fences and compel them to come in." Every burden bearer or porter uses a piece of bamboo split in half on his shoulder, with the two halves of his load suspended at the ends. The man carrying mud, tiles, bricks and similar things has rough baskets of bamboo strips suspended at the ends of his load carrier. A larger kind of basket made of finer strips of bamboo is used for carrying rice, corn and other cereals. A coarser round basket of longer shape is used for packing charcoal for market. Another of finer strips is used for washing rice for the table in the dirty canals, in fact, baskets of every conceivable shape for every conceivable purpose are made from the useful bamboo. The chair bearer has poles made of large bamboo, and the chair itself, with the exception of the floor and seat, is made exclusively of bamboo. The tailor and the silk and cloth merchants use a foot rule made of bamboo. The shopkeeper wraps up his parcels in bamboo paper and puts what small silver money he gets into a bamboo money box. This money box is a long tube with a sealed bottom. It fits into a groove at the bottom and at the top is held in its place by a lock. In this way it can only be turned upside down by unlocking it, and the size of the cylinder is such that a person's

hands could not be inserted for pilfering. Instead of gutter piping for the eaves of a house a large bamboo, split in halves with the diaphragms of the nodes struck out, makes a good substitute.

For domestic purposes the use of the bamboo is universal. The shoots, as soon as they appear above the ground, are dug out and eaten as a delicate vegetable. The chopsticks, with which the food is eaten, are generally made of bamboo. Kitchen cupboards, used for storing crockery and eatables, chairs, flower vases and hair combs are made of the same material. If a householder finds that the threshold of his door is wearing down, he nails on a strip of heavy bamboo to protect it. The housewife washes her clothes at the side of the canal and then dries them on a long piece of bamboo in place of a clothes line, supporting this substitute for a clothes line on a three-legged bamboo frame. She rocks her baby in a bamboo cradle. She sweeps up the dust with a broom made of bamboo twigs and sweeps it into a dustpan made of bamboo strips. Brushes, the bristles of which are made by splitting the continuation of the bamboo handle, are used for washing cooking pots and scrubbing rough surfaces. Inside the cooking pots a frame of split bamboo is placed, so that a bowl of anything may be heated or steamed by the water or rice underneath. Bamboo scrub is used for firewood. The remarks made about the numerous shapes of baskets used by tradesmen also apply to those used in the household. Bamboo frames are fastened on the beds to support mosquito nets and bamboo shavings are used for stuffing pillows, cushions and sometimes mattresses. The scholar writes with a pen the handle of which is made of bamboo; when he has used the pen he puts it upside down in a bamboo vase; he smokes a pipe made of a tube of bamboo with a small brass bowl, and, if the weather is hot, he uses a fan with a bamboo frame. If he leaves home, he sometimes uses a bamboo box for his clothes. The umbrella he carries in wet weather has a handle made of bamboo, with ribs of split bamboo, and it is covered with oiled bamboo paper. If the housewife goes out in wet weather, she puts on a pair of overshoes made of the husk which encloses the bamboo shoot as it comes out of the ground.

The above list of uses is not exhaustive, but enough has been written to show that the use of bamboo enters into every department of Chinese life. The bamboo is an invaluable possession, and the Chinese thoroughly appreciate it.

Failures of Adaptation. A chapter on adaptation would not

be complete without giving some instances of failures to adapt, or wastes. In view of the care and economy generally shown by the Chinese, some of these failures and wastes are very striking to a Western observer.

On a large proportion of the hill sides the growth of wood is kept down to scrub. The wood cutter only thinks of his present small benefit, not of the value of the timber that might grow for his son.

On some of the hill sides there is an abundant growth of grass. Much of this is coarse, but where it is eaten, it is proved to be nutritive and good. With the exception of a very few goats, no stock is kept to pasture on this grass.

The stagnant water kept exposed in earthen jars forms a fine breeding ground for culex mosquitoes, and the rice fields and swamps are equally well suited for the malaria carrying anopheles mosquito.

Superstitions. Many failures to adapt are caused by superstition. When a dog, or cow, or any other animal dies, the corpse would offend the god of the earth if it were buried, so it is thrown into the river or canal to rot away. Last summer rinderpest was raging among the cattle. On the river side at Ningpo the stench arising from these rotting corpses, as they drifted down on the tide, was sometimes too horrible for words. Rice, vegetables and clothes are washed in the canals, sometimes not far from decaying bodies. It is needless to point out how easily diseases of all kinds may be spread abroad. In the autumn cholera travels along these waterways.

A common form of superstition is called *fong-shii*, that is, the "influence of the winds and waters." This superstition shows itself in various ways, the commonest of which are three in number. First, a peculiar configuration of hills near a certain place may bring ill luck. For instance, an imaginary resemblance to a tiger's head and a lion's head on neighboring hills would be bad for places near to each other. The lion and the tiger might quarrel. A second way is to avoid all high buildings except pagodas and temples, which are built to control the *fong-shii*. The third way is to avoid all straight roads and paths. The common reason for this is that evil spirits can only travel in straight, or nearly straight, lines.

This superstition causes many an economic waste, and makes many an adaptation less effective than it would be otherwise. As an illustration of the first, all graves are made above ground, and must be in a place where the spirit of the departed will be comfortable.

The place is chosen by a Professor of *Fong-shii,* who earns his living by encouraging this superstition. The grave may be placed in the middle of a rich field. The platform of the coffin must be raised, and soil must be used for this purpose. Afterwards a huge mound is raised over the coffin, thus often using up the valuable soil of quite a large piece of land. Centuries of graves near large centers of population consume a large proportion of the productive soil.

The advent of western machinery is causing considerable disturbance to the second aspect of *fong-shii.* The unhallowed chimney shaft of a big factory breaks all rules. A few years ago a mint was built in the city of Hangchow, near the official quarter. Soon after it was finished, an old opium-smoking mandarin died from natural causes, or rather, unnatural causes, connected with his vicious habit. The cry was made that the *fong-shii* had been disturbed. The mint was taken down and the tall chimney was moved to another part of the city.

The effect of the third form of this superstition is shown in many ways. The doors of houses in a street are never placed opposite to each other. In some cases where the entrance of a house faces the open fields, a wall is built opposite to it. If a road runs straight alongside a main canal every time a bridge over a branch canal is crossed the bridge is built out into the main canal. To a person walking in the dark this is dangerous. Instead of being made straight, the canals are all more or less crooked. In cases where they are straight for any distance the bridges are sometimes built so low that boatmen are obliged to take down the covers of their boats before they can pass under. In other cases one or two embankments are built out into the canal from alternate sides to destroy the straightness, or a small loop is made with a shrine or a rest house built on the projecting piece of ground. A short canal used to lead directly from the Inner River to a market town called Meng-ky'i, about 15 [9?] miles northwest [N.] of Ningpo. For a time the town was not very prosperous. The inhabitants, therefore, dammed up the direct canal, and now the boatman is obliged to turn off into a branch canal to another town and turn back to regain the main canal, thus adding about two miles to a road, which was originally about half a mile. To a white man this would seem a strange way to help the prosperity of a place. The village of S-kwu-saen, on the side of the Ningpo Lake, has lately shown signs of decay, and the leading members of several families have died. It was decided that the cause of this was the open space of the lake opposite to the village. Although the authorities are very jealous

of any encroachments on the lake, no opposition has been made to the building of a dam opposite the village, for the purpose of regulating the *fong-shŭi*.

The above will show that most of the failures to adapt on the part of the Chinese in northeastern Chehkiang are caused by ignorance and superstition. The advent of modern education and of machinery, and, still more, the preaching of a religion which is in antagonism to all occult vagaries and superstition, will probably break down these failures and hindrances, so that a visitor fifty years hence may have a story to tell of almost complete adaptation.

HANGING VALLEYS OF THE YOSEMITE

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INTRODUCTION

So much has been written concerning the Yosemite Valley, that another contribution to the subject needs but a short preface. An elaborate description of the region would be out of place, since the salient features of the valley and its hanging tributaries are already familiar to geologists and geographers. Turner ("The Pleistocene Geology of the South-central Sierra Nevada, with especial reference to the origin of Yosemite Valley, 1900") has reviewed the literature relating to this region published prior to 1900, with especial reference to the theories of the origin of the Valley; and has described many of the topographic features in detail. He concludes that the Yosemite Valley was produced by normal stream erosion in extensively jointed rocks. Branner ("A Topographic Feature of

the Hanging Valleys of the Yosemite, 1903") has described the peculiar notches which frequently occur in the lips of the hanging valleys and has found in them confirmation of the theory that water and not ice was mainly effective in carving the main valley. In a short criticism of the paper by Turner, Gannett ("The Origin of the Yosemite Valley, 1901") expressed the opinion that "Yosemite is quite an ordinary and necessary product of glacial erosion." Among other papers published since Turner's review, mention may be made of "Glacial Erosion and the Origin of the Yosemite Valley," by W. P. Blake (1900), a general discussion of the subject in which the author maintains the glacial origin of the Valley. In a paper on the "Profile of Maturity in Alpine Glacial Erosion," D. W. Johnson (1904) regards abnormally deep portions of Sierran valleys as the result of glacial deepening. E. C. Andrews in discussing "Corrasion by Gravity Streams with Applications of the Ice Flood Hypothesis" (1909) treats the Yosemite as an ice-eroded channel.

The following pages discuss the former altitude of the Merced River in the Yosemite region, as indicated by the gradient of the tributary streams; the cause of the later over-deepening of the Merced, by which the hanging valleys have been produced; the process of valley widening in jointed rocks, considered in relation to the present width of the Yosemite Valley, and to the retreat of the lips of the hanging valleys; the notches in the lips of the hanging valleys, and their relation to the problem of glacial erosion.

The Former Elevation of the Merced River

In an earlier number of the *Bulletin* (November, 1909) the writer set forth in some detail his reasons for believing that the gradient of tributary hanging valleys furnishes the best means of determining with reasonable accuracy the amount of over-deepening which a main valley has suffered. Without entering again into a detailed discussion of the limitations of the method, it may be noted that measurements of gradient used in determining over-deepening manifestly should not be based in whole or in part upon the steep upper courses of tributaries, the over-steepened lower courses, very young streams having highly irregular longitudinal profiles, or very short streams. If measurements are restricted to the main portions of tributaries several miles in length which have more or less nearly attained to their profiles of equilibrium, the over-deepening of the main stream may be ascertained within fairly narrow limits, the danger of error being largely in the direction of an under-estimate

rather than an over-estimate. If a tributary has itself been over-deepened, the danger of under-estimating the over-deepening of the main valley is increased.

The excellent topographic map of the Yosemite Valley (hereafter called the "Valley Map") recently prepared by F. E. Matthes, affords a very satisfactory basis for calculating gradients of such portions of streams as are shown thereon. Unfortunately, only the lower courses of the longer tributaries are here shown; but we may estimate the over-deepening of the Yosemite Valley on the basis of this map (Scale: 1:24,000), which represents elevations by means of 50-foot contours, and compare the results with similar estimates based on the "Yosemite Quadrangle" (Scale: 1:125,000), where more of the streams are shown, but the contour interval is 100 feet. In every case mentioned below the over-deepening has been determined by plotting the gradient of the portion of the stream mentioned (AB, Fig. 1) to natural scale, projecting that gradient out over the main valley to where it would have joined the former Merced (F), and determining its elevation above the present Merced (P).

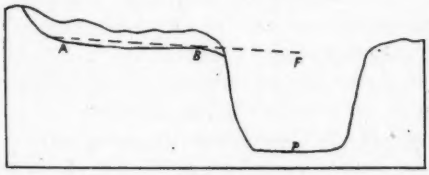

FIG. 1.

The Yosemite Creek flows southward through a hanging valley on the uplands of the Sierra to the Yosemite Falls, at which point it drops abruptly into the over-deepened main valley. Above the falls only about 2½ miles of the creek are shown on the Valley Map; for the first mile above the falls (up to the 6,750 foot contour) the gradient is a little steeper than for the next mile and a half. If we consider the more gentle gradient found along the creek above the 6,750 foot contour, we find that an elevation of about 6,575 feet is indicated as the former position of the Merced River. Considering the portion of the creek below the 6,750 foot contour, we get as the former elevation of the Merced, 6,400 feet. Basing our calculations on the average fall of the creek above the falls so far as shown on this map, we get 6,425 feet as the former elevation of the Merced. Turning to the Yosemite Quadrangle, we may compute the gradient of the creek for the last seven or eight miles of its course above the falls; and on the basis of this map we determine the former elevation of the Merced as 6,475 feet. As the floor of the Yosemite Valley opposite the Yosemite Falls has an elevation of about 4,000 feet,

the amount of over-deepening which has occurred in the main valley is, according to the four computations given above, from 2,400 to 2,575 feet,+the depth of alluvium on the valley floor,+any over-deepening of the hanging valley effected by the glacier which moved through it (Turner, *op. cit.*, p. 306). There is no reason to believe that the valley of Yosemite Creek was materially modified by glacial erosion; but the depth of alluvium on the main valley floor may be such as materially to augment the estimated amount of over-deepening.

The Valley Map shows practically the entire course of Indian Creek and of the East Fork of the same creek. Both of these are short streams, but in the portions of their courses above Indian Canyon both appear to have been graded with reference to a higher level of the Merced River. The gradient of Indian Creek for more than a mile above the head of Indian Canyon indicates as the former elevation of the Merced, 6,275 feet. A computation based on a simular portion of East Fork gives 6,400 feet as the indicated former level of the Merced.

Snow Creek is a longer stream, and is only partly shown on the Valley Map. The gradient of so much of the stream (above its over-steepened lower course) as appears on the map indicates 6,300 feet as the former elevation of the branch of the Merced into which it emptied. The average gradient for five miles along the course of Snow Creek, as shown on the Yosemite Quadrangle, indicates the somewhat higher elevation of 6,400 feet as the former position of the branch.

The Valley Map represents the lower portion only of Bridal Veil Creek, and shows it to be remarkably steep. A glance at the larger relations as portrayed on the Yosemite Quadrangle reveals the fact that the lower course of Bridal Veil Creek has been over-steepened, and that the Bridal Veil Falls do not represent the whole amount of discordance in the junction of tributary and main stream. Basing measurements on five or six miles of the streams' course above the ungraded lower portion, we find 6,500 feet indicated as the approximate former elevation of the Merced River.

Illilouette Creek presents a strong contrast with the other streams mentioned above. Only the lower part of the creek is shown on the Valley Map, and for the first mile above the Illilouette Falls there are indications of over-steepening of its course; but the gradient for four or five miles above the over-steepened portion, as measured on the Yosemite Quadrangle, indicates an elevation of but 5,750 feet as the former elevation of the Merced. If we make due allowance for

the over-steepened lower course of Illilouette Creek, the top of the Illilouette Falls would still be 700 feet lower than the top of the Yosemite Falls, or almost exactly the same elevation as the top of the Nevada Falls where the Merced River itself drops into the Yosemite Valley, from the higher level of the Little Yosemite Valley. The Yosemite and Mt. Lyell Quadrangles afford unmistakable evidence that numerous active glaciers once existed throughout the headwater areas of Illilouette Creek. The glacial gathering ground of the Illilouette drainage basin is larger and according to the contour maps shows more evidence of modification by glacial action than that of the Yosemite Creek basin. If under apparently less favorable conditions a glacier could extend from the headwaters of Yosemite Creek to the main valley (Turner, *op. cit.*, p. 306), it is reasonable to suppose that a glacier may likewise have extended from the headwaters of Illilouette Creek to its junction with the Merced River. Granting for the moment that glacial erosion is a possibility, the unusually low level of the Illilouette Valley is readily explicable on the basis of over-deepening effected by the Illilouette Glacier. In this connection it may be pointed out that the form of the lower Illilouette Valley above the falls, as shown by the map and as seen in the field, suggests the probability of modification by glacial action. Furthermore, of the glacial tributaries to the Yosemite Valley the Tenaya Glacier was probably the largest, with the Merced Glacier second, as pointed out by Turner (pp. 305, 306). That author mentions the Yosemite Creek Glacier next, and says of the Illilouette Glacier, "The Illilouette Glacier probably likewise reached the valley, but I have obtained thus far no positive evidence that it did so." For reasons set forth above, I should rank the Illilouette Glacier third in probable size, and the Yosemite Creek Glacier fourth. Whether this order be correct or not, the degree of apparent modification of the valleys follows this same order; the Tenaya Canyon being most striking in form and depth, the Little Yosemite Valley of the Merced River next, Illilouette Valley third, while Yosemite Creek Valley shows very little evidence of modification.

Tenaya Canyon and the Little Yosemite Valley are not considered as hanging valleys and therefore not used in the present computations, for the obvious reasons that Tenaya Canyon does not "hang" but is more closely related in form and depth to the main Yosemite Valley; while Little Yosemite Valley, although at a higher elevation, is the valley of the main river itself. Both will be referred to again in another connection.

If we except the Illilouette Valley, there is a marked agreement

in the evidence furnished by the hanging valleys as to the former elevation of the stream with reference to which they were then graded. In plotting the average gradients and computing elevations I have tried to estimate 25-foot divisions. The method does not permit sufficient accuracy to make the figures trustworthy within such narrow limits, when based on the maps mentioned. It seems safe to say, however, that the hanging valleys furnish convincing evidence that the Yosemite Valley has been over-deepened to the extent of from 2,200 to 2,500 feet, at least. If we plot cross-profiles of the valley, and continue the curves of the walls below the alluvium of the valley floor in such a manner as to give the form of a typical glacial trough, we are led to infer a probable depth of alluvium of from 300 to possibly 1,000 feet; or a total over-deepening of 3,000 feet or more. A minimum of "over 2,000 feet" is certainly a conservative way of stating the amount of over-deepening. The cause of this profound over-deepening may be next considered.

The Cause of Over-deepening

In concluding his discussion of the origin of Yosemite Valley, Turner mentions four theories which had been advanced to account for the formation of the valley:

1. That it was scooped out by ice (Muir).
2. That it was a river-cut canyon, but that the vertical walls are due to the sapping action of ice (W. D. Johnson).
3. That it was formed by a drop fault (Whitney, Reyer, LeConte? and Russell).
4. That it was formed by river erosion facilitated by strong jointing (Becker, Branner, Turner).

To the objections urged by Turner (p. 317) against the third of the above theories (faulting) may be added the following: the hanging valleys were evidently graded with reference to the Merced River and Tenaya Creek before the deep valley of the Yosemite was formed; the relation of tributaries to main stream has not been changed by the formation of the Yosemite Valley, except as regards their hanging character; hence, if the Yosemite Valley is a graben, the down-faulted block must have happened to coincide with the irregular course of the established Merced River, and must have sent off a branch graben at its eastern end to coincide with the already established Tenaya Creek. The fault theory is so improbable that we must look to normal river erosion or glacial erosion for an explanation of the Yosemite Valley.

The character of the Merced Valley west of El Portal leaves no doubt that this portion of the valley was carved by the river which occupies it. A cross profile of this portion of the valley has the typical V-shape of a youthful stream gorge, the valley walls sloping steeply down to the water's edge in many places. So far as one could judge from car-window observations, the tributaries from Bear Creek to Moss Creek enter the Merced with essentially accordant junctions. The mountain spurs on either side of the valley interlock in such a manner as to prevent extensive views up or down the valley, and the railroad which follows along the river seems to be made up almost wholly of curves, with relatively few and short straight segments. All these are features which we should expect to find in a stream-carved valley, and all contrast strongly with the features encountered in valleys known to have been long occupied by important ice streams. We must therefore conclude that the valley west of El Portal was carved by the Merced River; and this conclusion carries with it the reasonable inference that the Merced River east of El Portal has likewise been an efficient agent in valley making. Indeed, the existence of a well-developed normal valley system in this region prior to glaciation has been so well established by the studies of different geologists that the formation of the Yosemite Valley by ice erosion alone seems most improbable.

On the other hand, it is generally agreed that river erosion alone will not account for all the features observed in the Yosemite. Of the geologists cited by Turner as accepting the river erosion theory, all three ascribe at least some erosive work to the glacier which is known to have occupied the valley, in such terms as "the process being completed by a glacier" (Becker), "ice deepened and modified it (Yosemite Valley) locally during the glacial epoch" (Branner, in personal communication), or "rounding off the projecting shoulders and spurs" by a glacier (Turner). The problem resolves itself into an evaluation of the relative importance of water erosion and ice erosion in the carving of the Yosemite Valley. Concerning this problem there still exist wide differences of opinion; and it is therefore pertinent to consider such evidence as the hanging valleys offer as to the process by which they were left in their hanging position.

The geological history of the Sierra Nevada and the general principles of river erosion are sufficiently well understood to enable one to reconstruct with reasonable certainty the physiography of the Yosemite district before the Merced had cut its canyon. With this as a starting point, one may consider the later erosion history of the region; first, on the assumption that the hanging valleys were in the

main produced by normal over-deepening of the Merced River; and second, on the assumption that glacial erosion was largely responsible for the over-deepening of the Merced.

It has been shown by Turner and others that during the Cretaceous, Eocene and Neocene the region now occupied by the Sierra Nevada was reduced by subaërial erosion to a surface of relatively slight relief, drained by southwestward flowing rivers. Many of these rivers were displaced from their former channels by lava flows during the late Neocene, but it is believed that by the close of the Neocene or early in the Pleistocene the essential features of the present drainage pattern were established. Toward the end of the Neocene occurred the uplift of the Sierra block which greatly increased the gradient of the southwestward flowing streams, and caused them to incise the deep and narrow canyons which form one striking element in the present topography. The process of canyon cutting was well advanced before the advent of the glaciers, which ultimately occupied the summit of the range and made their way some distance down the canyons of the southwest-flowing streams.

Remnants of the ancient erosion surface which formed the back (southwest) slope of the Sierra block, and beneath which the canyons have been sharply incised, may be observed to advantage from various points on the trails about the Yosemite. Although it would appear that this part of the Sierra region was never so nearly base-leveled as some portions of southern New England or of the Piedmont Belt, still the amount of relief on the intercanyon upland areas is so moderate as compared with the total relief, that one is very strongly impressed with the reasonableness of the interpretation which regards the back slope of the Sierra as an uplifted and dissected erosion surface. Whether the back slope has resulted from actual tilting, as hereafter assumed, or from a process of distributive faulting as suggested by Becker (63-67), is not essential to the present discussion. It should be stated, however, that Becker's argument against tilting, based on the failure of some of the streams to cut below their old Pliocene channels in their headwater areas, seems of doubtful value to the writer, inasmuch as it depends on the assumption that "uniform tilting would uniformly increase the grade of the streams flowing westward." This assumption would be true in the case of streams still flowing on the surface of a tilted block immediately after a rapid uplift; but is erroneous when applied to streams which have entrenched themselves after uplift, as have the Sierran streams. In like manner, Becker's appeal to the protective action of an ice cap over the high Sierra to account for deeper

canyon cutting farther down the slope seems unnecessary, as well as incompatible with the widespread evidence of glacial erosion instead of protection, in the glaciated areas.

Consequent upon the uplifting and tilting of the partially base-leveled surface, the Merced and other large southwest flowing streams must have entrenched themselves very rapidly, while weaker tributaries deepened their valleys more gradually, especially if they flowed at right angles to the main stream and hence did not have their gradients affected by the southwest tilting. Thus the tributary valleys would come to hang above the main stream. The development of the hanging relation was presumably most pronounced along the middle courses of the Sierran rivers; for near the western foothills the amount of uplift is so slight that no great discordance in junction of main and tributary streams is possible; while near the headwater areas the contrast in volume between the main stream and a tributary decreases to such an extent that one is about as powerful as the other. Even if tilting increased the gradient of the main stream alone, in the headwater areas, there could hardly develop so great a discordance in junction as would occur farther down the valley where the main stream not only experienced the same increase in gradient, but was also a much more powerful stream than its tributaries.

There is a distinct limit to the time during which hanging valleys can remain as such. As soon as a main stream has effectively entrenched itself, and begins to establish a profile of gentle gradient, its energy decreases. The tributary streams continue to degrade their valleys until accordant junctions with the main stream are established. It is a well-substantiated law of stream action that the time required for a main stream to reduce its channel to a faint gradient and to open out its valley floor to a width not many times greater than the width of the stream, is longer than the time required for hanging tributaries to reduce their valleys to accordant junctions. Accordingly, while hanging valleys might exist along the Merced and similar rivers, especially along the middle courses of such rivers, so long as the main streams occupied narrow V-shaped gorges of fairly steep gradient, it is safe to say that the more open and flat the main valley floor became, the less would the tributary valleys hang; and that where the main valley floor had come to be several times wider than the stream, and of very low gradient, no hanging valleys would exist.

If we proceed on the assumption that the glaciers which invaded the upper portions of some of the Sierra canyons were powerful

eroding agents, we arrive at certain conclusions directly opposed to those outlined above. Below (southwest of) the glaciated areas, hanging valleys entering V-shaped canyons might exist, as before. But in the headwater areas, instead of no hanging valleys, or hanging valleys developed on a smaller scale than farther down stream, these features might constitute a much more important element in the topography than elsewhere, because of extensive glacial over-deepening of favorably located headwater valleys. And since an eroding glacier would carve for itself a channel far wider than the ordinary stream channel, and might reduce or even reverse the gradient of any valley into which it came, we should expect, after the disappearance of the ice, to find the hanging valleys associated with a wide open main valley (the channel of the former glacier) whose floor might be occupied by lakes, or by a débris plain over whose flat surface the main stream would wander at will.

An examination of the maps and literature of the Sierra region shows that hanging valleys are not an uncommon feature of Sierran topography, even in unglaciated districts. Apparently, the uplift and tilting of the ancient surface of erosion was sufficient to cause the main streams to entrench themselves faster than many of the tributaries. The hanging effect thus produced still persists in a number of the tributaries, especially where the tributaries are much smaller and weaker than the main stream. But the distribution and character of hanging valleys in the Sierras is very significant. In the first place, they are not best developed along the non-glaciated middle course of the Merced River, as we should expect if they are due to stream erosion alone, but are far more impressive in the heavily glaciated Yosemite Valley region, and even farther east; that is, in the headwater portion of the system. Indeed, it is difficult to find typical hanging valleys of any size below the limit of glaciation at El Portal. Even small streams, such as Ned Gulch, have there effectually reduced their valleys to accordant junctions with the still youthful Merced. Bear Creek, however, is so steep for the lower two miles of its course that it suggests an over-deepening of the Merced of possibly 800′, although the process of grading the creek valley is so far advanced that no typical hanging valley exists. The North Fork of the Merced River, as shown on the Sonora Quadrangle, is likewise over-steepened for the last mile of its course; the average gradient of the main part of the North Fork valley would, if continued, intersect the Merced Valley 250′ above its floor. Bull Creek, in turn, has an average gradient for eight miles along its course which would intersect the North Fork, to which the creek is

tributary, something less than 400′ above the present level of the Fork. It is apparent that these hanging valleys, whose features are not typical, and whose discordance in junction is usually but a few hundred feet, are not to be compared with the hanging valleys of the Yosemite, where tributary streams cascade abruptly down the main valley walls, and have a quite uniform discordance in junctions of more than two thousand feet.

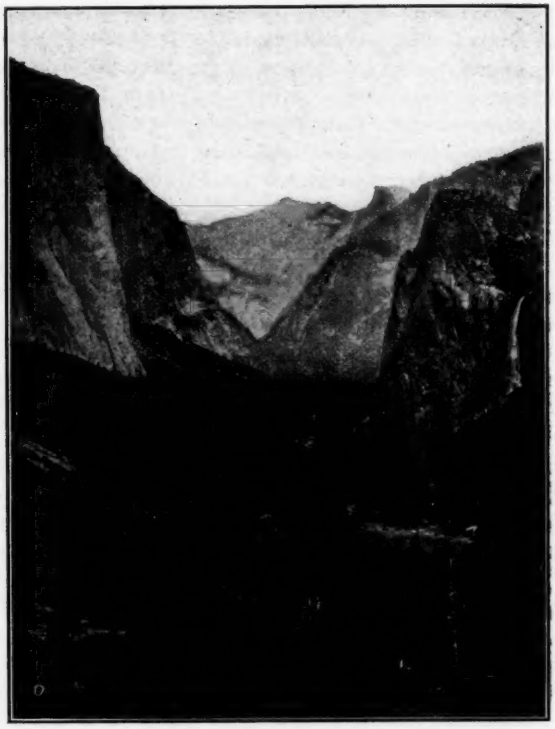

FIG. 2—Yosemite Valley looking east.

The hanging valleys west of El Portal enter a narrow-bottomed gorge of fairly pronounced gradient. The hanging valleys of the Yosemite enter a main valley (Figure 2), whose floor is many times the width of the main stream, and whose gradient is unusually low. In this contrast we find further evidence that the hanging valleys of the two areas are of different origin.

It appears, then, that the character and distribution of the hanging valleys along the Merced are just the reverse of what we should expect, assuming stream erosion to be the only important factor in their formation; but accord perfectly with the theory which admits extensive glacial erosion in the headwater areas, and accelerated river erosion farther downstream. Extensive over-deepening of the Yosemite Valley by glacial erosion seems to me as necessary a conclusion as the formation of the V gorge of the lower Merced by river erosion. Judging from the relations of the tributaries west of El Portal, from the character of the longitudinal profile of the Merced itself (described below) and from the position of the Yosemite near the headward portion of the Merced basin, I should imagine that little if any of the observed over-deepening of the Yosemite is to be charged to the acceleration of the Merced in preglacial times; and that glacial erosion is responsible for the major part of the more than two thousand feet of over-deepening observed, plus the unobserved amount concealed by alluvium on the valley floor.

(*To be concluded.*)

EXPLORATIONS IN DUTCH NEW GUINEA

Dr. Lorentz's Ascent of Wilhelmina Peak

We were almost completely ignorant of the interior of Dutch New Guinea until the explorations that were begun in 1903 by the geologist and historian, Prof. Dr. C. E. A. Wichmann. He, however, made Humboldt Bay on the north coast the chief scene of his labors. His work was followed by the South-West New Guinea Expedition in 1904-1905, led by Captains Posthumus Meyes and De Rochemont, who discovered East Bay and the North River on the south coast. Various other parties have contributed to our information; and Dr. H. A. Lorentz led expeditions into southern Dutch New Guinea in 1907 and 1909. In January and February last Dr. Lorentz gave a lecture on his last explorations before the Royal Geographical Society in London and the Scottish Geographical Society in Edinburgh, and the paper is printed both in the *Geographical Journal* for May and in the July number of the *Scottish*

Geographical Magazine. The following summary of his work in 1909 has been prepared from this paper.

In the expedition of 1909 he reached Wilhelmina Peak, though in 1907 he attained only the southern edge of the Snow Mountains, while Wilhelmina Peak is on the north side of the range. Two hundred and eighty-six years after Jan Carstensz mentioned in his journal that on Feb. 16 he saw mountains covered with snow, the Lorentz expedition reached these untrodden snows.

The members of the expedition consisted of Dr. Lorentz (leader and zoologist), Commander J. W. van Nouhuys (geology, cartography and meteorology), Surgeon v. Römer (botany, medicine and anthropology), a native physician and about 100 Dyak carriers. He was also accompanied by a small military force under command of Lieut D. Habbema. On Aug. 5, 1909, the party sailed from the port of Soerabaja, Java, and on Sept. 1, they arrived at East Bay on the south coast of New Guinea. Three large rivers, the Oetoemboewe, North and North-West, empty into this bay. It was the starting point for the interior. The field of Dr. Lorentz's work extended from the sea to Wilhelmina Peak between 138° 30′ and 138° 45′ E. Long.

The North River offered the best route for penetrating as far as the mountains. Dr. Lorentz was only twenty-two days in reaching Alkmaar at the base of the mountains, though in 1907 he had spent seventy-nine days on the way. On Oct. 4, the expedition was assembled at Alkmaar, where provisions were stored for 100 days. Here, on Oct. 27, the tramp over the mountains to Wilhelmina Peak began.

Although Wilhelmina Peak is only about thirty-five miles from Alkmaar, the difficulties of the route were so formidable that it seemed likely at times that the expedition would not reach the goal. On the way, the party met the mountain Papuans, who proved to be an interesting people, and it was not difficult to establish friendly relations with them. As the ascent of the mountains proceeded, the weather became very bad, the temperature was low and continuous fog made it difficult to see the route. The summit was finally reached on Nov. 8. It was impossible to climb the steep wall of rock leading to the peak, but a crevice was finally discovered in the wall through which the explorers forced their way upward. They followed the top of the wall to the summit of the mountain, which is crowned with eternal snow. The hypsometer registered 15,125 ft. The height of Mont Blanc is 15,750 ft. To the north they had an uninterrupted view, for only low mountains stretched to the

horizon. A lake down in the plain below them was named after Lieut. Habbema. The conjectured elevation of this lake is 11,800 feet.

The retreat back to the sea was most exciting and unfortunate. Dr. Lorentz fell into an abyss and was found in a swoon with a broken rib and bruised limbs. A series of misadventures accompanied the party as far as Alkmaar. They were overwhelmed with snow, a number of the men were badly frost-bitten and the party nearly starved. On Dec. 15, they finally arrived at Alkmaar after an absence of sixty-eight days in the primeval mountain forest. The remainder of the journey to the sea was easy.

The expedition secured more proofs, relating especially to the fishes found in the river, that New Guinea belongs to Australia. The botanical results prove that in New Guinea transitions may be found from the genuine tropical to the Alpine flora. The majority of plants have, however, a Malayan character, but there are such a large number of endemic forms that New Guinea and the adjacent islands can be separated from the Sunda Islands as a dominion in itself (Papuasia). On the south coast there are extensive marsh woods, like those found in India. Where the soil is more solid, savannahs were found here and there covered with acacia and other intruders from north Australia. The Alpine flora has a northern character unlike the Australian flora. It resembles that of the mountains of Java, Sumatra and the Himalayas (Rhododendron, Ericaceae, Viola, etc.).

"The south coast consists of a large alluvial plain, sometimes miles in width, cut by a great number of rivers which drain it and bring its abundant waters to the sea. The trend of the hills and mountains is principally east-west, which causes great trouble to explorers, as the ridges cannot be followed, but always have to be crossed. During the expeditions of 1907 and 1909 eruptive rocks were not found. The mountains crossed proved to be of recent formation. The Wilhelmina Peak consists of alveoline limestone. Eruptive rocks have been found near Geelvink Bay. The Wichmann Mountains [about 13 miles S. of Wilhelmina Peak] consist partially of sandstone. Concerning the snow, I may mention that we did not meet with real glaciers—the heat of the tropical sun must prevent their formation—but we found many traces that they have existed. We saw on the top of the Wilhelmina Peak the so-called *firn*.

"A distinction must be made between the Papuans living in the plains near the river and those in the mountains. The river Papuans live chiefly on sago and bananas, and have as animal food, hogs, fish, kangaroos, cassowaries, etc. As sago does not grow in the mountains, these Papuans eat principally yams and bananas, and also hogs, rats, and mice. Both of these tribes live in a typical Stone Age. Their arms are bow and arrows, spear, club and stone axe. Their arrows are not poisoned. None of them wear any clothing; not even the people who live above 10,000 feet. It is remarkable that they do not know the

use of bark. I am not convinced that they are cannibals. I collected about eighty human skulls, and on asking a native where the remaining portions of the skeletons were, he gave me to understand that they were eaten. It is possible that he misunderstood me; still those skulls are valuable from an anthropological point of view, as we can be sure that they belong to a race which is free from mixture with other races. Besides their weapons, they never go out without their bag, containing tools for daily use. They give evidence of great skill in making their canoes with stone axes. I happened to be in their village when they were busy with their work and they soon understood the superiority of iron tools."

Captain Rawling's Explorations

The British Ornithologists' Union decided in 1908 to send an expedition to southern Dutch New Guinea to make a collection of its fauna and flora for the British Museum. The immediate goal was the great central Snow Range. Mr. W. Goodfellow, a well-known ornithologist, was appointed leader, botanists and collectors were chosen, and Capt. C. G. Rawling, whose notable surveys and map work in western and southern Tibet have made him well-known, represented the Royal Geographical Society and had charge of the geographical explorations. The following short account of Capt. Rawling's work is condensed from his paper "Explorations in Dutch New Guinea" published in the *Geographical Journal* (Sept. 1911, pp. 233-255, map and ills). The expedition left England in October, 1909, and reached the mouth of the Mimika River, on the south coast of the island (136° 29′ E. Long.), early in 1910. Capt. Rawling's explorations, to some extent, supplemented the work of Dr. Lorentz, though their fields were not contiguous. The work of both expeditions extended from the south coast to the central mountains, Lorentz crossing them while Rawling reached their southern edge. The eastern limit of the geographical work of Capt. Rawling was about 100 statute miles west of the western limit of Dr. Lorentz's explorations.

At the mouth of the Mimika River the ship lay three miles out to sea in four fathoms of water. Rawling with two men started in the launch to explore the Mimika River, which is 1,500 yards wide at its mouth. At the third mile they found a great river entering from the west which the natives called the Watuka. It supplies two-thirds of the water reaching the sea and its discovery was a surprise, for Dutch explorers of the lower Mimika, a few years ago, made no reference to the Watuka of which the Mimika is only a tributary.

Crowds of Papuans, men, women and children, put out from the river banks in canoes, shouting a welcome. The village of Wakatimi, on the right bank of the Mimika, about four miles above its

confluence with the Watuka, consists of a long row of about 150 huts built of pandanus and palm leaves with a row of cocoanut trees in front. The women had disappeared, but crowds of men pressed around to gaze upon the strange creatures who had entered their country. The Mimika coast native, almost coal black in color and rather taller than the average European, is physically an almost perfect man, but his brutal features make him very unattractive. The women have little time to think of anything but work. Slaves from childhood, working from daybreak till long after dark in the search for food and to make the man, their master, happy, they rapidly become old, haggard and hideous. No signs of cannibalism were seen.

The natives willingly sold canoes for the ascent of the Mimika. The favorite canoe in these parts is between fifty and sixty feet long, taken from one tree trunk and hollowed by stone axes, fire or old pieces of iron obtained in coastal trading. The labor of making and launching these canoes is enormous. The tree must first be cut down, and as suitable trees are rarely found close to the river bank, a clearing in the forest is made and the great log is dragged to the launching place by the combined strength of the whole village. The hollowing, finishing and decorating are done at the village, the whole process often taking many weeks and even months.

Ascending the Mimika, the furthest navigable point at the village of Parimau was reached on the seventh day out. The ascent was very difficult. One day the river was a swollen torrent, the next a series of pools divided by banks of soft mud, or tangled masses of tree trunks, and over or through these obstructions the heavy laden canoes had to be hauled. When in flood, no bottom could be found with the poles; at low river there was insufficient water to float the canoes. On both banks grew the densest vegetation. Mighty trees fought for existence with thousands of younger growth, the whole held together by a tangled mass of rattan and other creepers.

From Parimau, Rawling and three comrades traveled to the north-north-west to the Kaparé River, seven miles from the mountains. This was believed to be the best route to the mountain region, but as the carriers refused to go further, the party was compelled to return on the third day. As the Kaparé was here 200 yards in width, with great forests and mountains close at hand and the mighty precipice beyond, it was still thought that this route would be best for a forward advance; so Rawling remained to clear the route while Goodfellow returned to Wakatimi to send a party up the Watuka, which was believed, and afterwards proved, to be the lower

course of the Kaparé. Thus it resulted that both the Mimika and the Watuka-Kaparé Rivers were explored.

All attempts to get far up into the mountains failed on account of the tremendous difficulties of the advance, the desertion of the native helpers, the inadequacy of supplies, the decimation of the force of carriers by disease, etc. The explorers, however, cleared an area of forest land at Parimau, from which they had a fine view of the mountains.

"It was easy to fix all the points in the range from Carstensz in the east to Mt. Leonard Darwin in the west. The height of Carstensz, formerly assumed to be about 18,000 feet, was found to be nearly 16,000 feet, while to the west three more great snow peaks were discovered with a height of about 15,400 feet; these we named Mt. Idenburg, after the present Governor-General of the Netherlands India. . . . Beyond and between these two mountains two other great snow peaks were visible, evidence that the ground to the north does not fall abruptly away. But more interesting than all was the discovery that the great range stretching from Carstensz in the east to the Charles Louis Mountains in the west, a distance of eighty miles, formed one immense, unbroken precipice, culminating in its greatest sheer height at Mt. Leonard Darwin (named after the late President of the Royal Geographical Society). We were never in a position to measure with the theodolite a greater sheer height of more than 6,500 feet, but from many views obtained while climbing, I have no hesitation in stating that the greatest perpendicular height is, at this spot, not less than 10,500 feet, or two miles. To the west of Mt. Darwin the range continues to diminish, the precipice dwindling in proportion. To the eye this wall of limestone rock, though split into many sections, appears quite impregnable, a perpendicular wall of dead black stone, relieved by splashes of white where the water catches the rays of the sun."

For seventeen miles to the south of the precipice are two ranges of hills, of an average altitude of 8,000 feet, cut by the great rivers flowing from the north and worn into fantastic shapes. These lower ranges are covered with dense vegetation, the high range behind being bare and barren. The snow line is at about 14,500 feet, the glaciers on Carstensz Peak descending lower and falling over the precipice to the south. Capt. Rawling shares the view of Lieut. Postema of the Dutch navy that Carstensz Peak is not climbable. The wetness of this district is doubtless due to the high altitude and proximity of these mountains, the rainfall being in excess of that in any other part of New Guinea.

Capt. Rawling gives a description of the appearance of these great mountains as seen from the deck of an ocean steamer, moving east along the south coast of Dutch New Guinea:

"We were rapidly approaching a great bluff, the south end of the Charles Louis Range. Changing course eastwards, the whole range of snow-capped mountains was unfolded to our view as the morning mists dispersed. Stretch-

ing in one unbroken line, from the Charles Louis Range on the west to the Orange Range on the east, lay what was then known as the Snowy Range, but which her Majesty the Queen of the Netherlands has been graciously pleased to allow me to name the Nassau Range. Rising to its greatest height in the east at Carstensz Peak, seen by a Dutch Captain of that name in 1623, it runs nearly level for sixty miles to the west, the snows giving place to a mighty precipice, and then gradually falling away to the dividing valley before the Charles Louis Range is met. In front and barring our approach lay range upon range of knife-edged ridges and forest clad mountains broken into sections where cut by the rivers flowing from the north. For fifty miles from the coast lies a dense forest-covered swamp in no spot rising more than a few feet above sea level."

While defeated in their efforts to ascend into the mountains, the expedition succeeded in exploring an important number of rivers, including, besides those already named, the Tuaba, the Kamura and the Wataikwa. The explorations in the lower plain extended for about forty miles east and west between the sea and the mountains. Swamps, jungle or impassable forest cover nearly all the region between the watercourses. The floods of 1910 were probably exceptionally great. The lowlands were almost impassable. The casualties from death and sickness in the expedition were truly appalling. During the first year twelve per cent. of the total force died. Of 300 men employed during the first twelve months only eleven lasted out the expedition, and of these four were Europeans.

On the Upper Kaparé River, Rawling first met the pygmies. These little folk showed no active hostility, but evidently did not desire the white men's company. Their habitations were not seen, but where they were met they had cleared an area of about 120 acres, on which they grew taro and sweet potato. Nine months later Rawling had a better opportunity to study the pygmies at one of their villages. Some forty men or more appeared, but although large bribes were offered for the sight of a woman, none put in an appearance, and their fires that night showed them encamped high up the mountain side. No pygmy woman was ever seen by the expedition, the men refusing to exhibit their wives, even though tempted with the unheard-of price of two axes a woman. Prof. A. C. Haddon, the well-known anthropologist, is inclined to believe that the New Guinea plainsman and the pygmy are of the same aboriginal stock, and that the stronger members of the tribe having seized those districts where food is most abundant, have developed proportionately; while the weaker are not degenerate, but are the true representatives of the original race. In some ways the pygmy seems to be more intelligent than his lowland neighbor. He builds his house on piles and for permanent use. He uses numerals up to

ten, while the plainsman has words for only one and two, any numeral above these being shown by the fingers and toes. The pygmies are the keenest of traders and were willing to exchange everything they possessed, excepting their best arrows, for cloth or a knife.

The expedition lived for over a year among the Papuans of this region and obtained some insight into many of their customs. Marriage is of little importance and was witnessed only on one occasion, when the men who had escorted a bride up a river betook themselves to their homes, while the bride, preceded by an old woman crawled through the mud on her hands and knees and in this degraded position disappeared into her future home. When a person dies the whole population break into a loud wail, and all smear themselves from head to foot with mud. The amount of howling depends upon the importance of the deceased person and is incessant until the corpse is buried. The explorers were surprised by the richness and variety of the singing and chanting. An impromptu song is devised, and the vocalist, bedecked in plumes from the greater bird of paradise, is accompanied by an orchestra of drums, the chorus ending in a shout resembling the bark of a dog and given in unison. These concerts occur on all festive occasions.

Summing up the final results of the expedition Capt. Rawling says:

"Large and valuable collections of birds, mammals, reptiles, butterflies and moths had been formed together with botanical and ethnographical specimens; a new and unknown race of pygmies discovered, studied, measured, and photographed; a range of mountains, containing the greatest precipice in the world; together with 3,000 square miles of country, surveyed and mapped, new snow-mountains found, and many great rivers explored; and a long stretch of coast-line surveyed. We had accomplished the longest cross-country journey ever undertaken in Dutch New Guinea, *i. e.*, eleven marches from the up-river camp, had proved the impossibility of the Mimika river as a line of advance to the Snows, and on the other hand the value of the great rivers to the east if the same goal is intended. From experience, and our heavy death-roll will bear me out, I have no hesitation in saying, firstly, that the land is an impossible one to any but a Papuan; and secondly, that, unless most carefully picked, no native of the East Indies, with the exception of the Dyaks from Borneo, are of the slightest value as carriers in South Dutch New Guinea."

AUGUST PETERMANN: A REVIEW*

The book is a study of the life work of the famous Gotha geographer and agitator, viewed in relation to the geographical situation of his time. After a brief sketch of Petermann's life the author gives an appreciation of his many-sided activity as a practical geographer, an originator of geographical theories, and a cartographer, and determines his place in the history of German geography.

The "leading motive" in the life and work of this extraordinary man was the passion for the scientific exploration of the earth, the desire to fill up the gaps in our knowledge of the foreign parts of the world regardless of political or material advantages. To obtain this end he picked out the men most fit to do the work, secured the funds necessary to carry it on, and mapped out the lines along which it would bring the best results; as soon as their reports began to come in he worked them up in order to ascertain, map, and publish their results as quickly and widely as possible by means of his *Mitteilungen*. The latter became, in this way, the leading and central organ of the time for all matters pertaining to the progress of exploration regardless of the nationalities of the explorers. Likewise the Perthes Institution developed into the great clearing house for reports of travels and discoveries, rivalling even the corresponding geographical centers of England.

There was at that time no man in Europe who knew better than Petermann the problems that were still awaiting their solution in the unknown parts of the globe, nor which of these problems must be attacked next, nor who would be the best man for the one which happened to be under consideration. After the great success that he had in the case of Barth, hardly any expedition was organized without his advice. African and Arctic explorations especially received a new impetus through his efforts, most decidedly in Germany, where the geographical interest had long been dormant owing to her deplorable political condition. He was indeed the father of modern German geographical exploration, and he even attempted to put it on a permanent basis by founding a great national German geographical society, after the pattern of the Royal Geographical Society; but this was one of the few enterprises in which he did not succeed.

Aside from this practical work as an organizer and promoter of geographical discovery, he must also be classed among the principal theoretical geographers of Germany. Just as Cuvier, from the few remnants of his marsupial, determined what the whole animal when discovered would look like, thus Petermann divined, from the scant reports of early Australian travelers, the character and climate of the interior of Australia and lived to see his theories justified by later explorers. In a similar way he anticipated much of the geography of central Asia and Africa so that his theories could

* August Petermann. Ein Beitrag zur Geschichte der geographischen Entdeckungen und der Kartographie im 19. Jahrhundert. Anhang I: Petermanns Schule. Anhang II: Bibliographie. Von Dr. phil. E. Weller. x and 284 pp. Vol. IV of "Quellen und Forschungen zur Erd- und Kulturkunde" edited by Dr. R. Stübe. Otto Wiegand, Leipzig, 1911.

serve as a basis for laying out the work of the discoverers in those regions. His pet theories, however, concerned the Polar seas and the Gulf Stream. Keeping at a sane distance from both the Palæocrystic and the Open Polar Sea hypotheses, he arrived, through the comparative study of the physical and meteorological conditions as reported by previous explorers, at the conclusion that only a partly open sea was possible under those high latitudes, and that the American and the Asiatic part of that sea must be very different with regard to the temperatures of their waters, the occurrence of ice, etc. He insisted upon the fact that the character of those regions could not be determined by latitude alone, and that they must be largely modified by the shape and distribution of the land, ocean currents, and similar factors of a purely physical nature, and his propaganda for polar expeditions was not influenced by the search for any north-west passage, but only by the desire to obtain reliable observations for the study of these general physical conditions of the Arctic which must, in their turn, deeply influence the climate of the more southerly latitudes. He therefore pleaded for establishing a number of permanent observation stations all over the Arctic zone, which have now become to some extent an established factor in Polar studies.

Very closely connected with his polar theories and, in fact, at the bottom of much that he said concerning them, was his theory of ocean currents, especially of the Gulf Stream. Although overestimating its influence, he justly recognized it as the cause of the milder climate of Northwestern Europe and the adjoining seas, and to him must be given the credit of having been the first who studied that current not as a local, but as a telluric phenomenon. This must be especially emphasized, because, owing to the fact that his utterances on the subject have never been published as a whole but were widely scattered through many contributions to the *Mitteilungen* and other magazines, he has never received the appreciation for it which he deserved.

Much better known is his work as a cartographer. His Altas of New Zealand, his nine-sheet map of Australia, his six-sheet map of the United States, were epoch-making in the cartography of those countries, and it was he, too, that made Stieler's Hand Atlas what it is to-day. The superiority of Petermann's maps over other maps of his time was a direct effect of his zeal for scientific exploration. It was only on the map, he believed, that the results of the latter could be clearly expressed. "That which, in a written report, may be circumscribed or considered doubtful, must take a *definite* shape on the map," was his fundamental conviction, and he endeavored, therefore, to give on his maps as accurate as possible a picture of the actual conditions on the surface of the earth. His abilities, fortunately, were adequate to his ambitions. With the latest knowledge about all parts of the world which established the scientific accuracy of his work, he combined the technical skill and refined taste of the master cartographer. These qualities made him the originator of a new style in German cartography the standards of which became the gauge of merit for maps all over Germany, so that the excellence of modern German maps may be directly traced to Petermann's influence.

His limitations are seen in the overestimation of the map: to him, map-making was practically scientific geography itself, and a topographical map which would reproduce exactly every spot of the earth as it is in nature would have meant to him the most valuable result of geographical effort. Such opinions indicate the reaction which had set in against the cosmic specu-

lations of Humboldt and the anthropogeographical theories of Ritter. It is because in either of these fields an enormous amount of positive knowledge of single facts is needed in order to generalize with any claim to accuracy, and that this very basis of the science appeared to him, at the time, rather indefinite and incomplete, that he wanted first of all to make sure of the facts themselves. Thus he holds, in the middle of the nineteenth century, a place entirely by himself, embodying the transition from the old speculative to the new empirical method in geography.

In the first appendix the author tells the story of Petermann's school and his most noteworthy disciples: Ravenstein, Hassenstein, Debes, Friederichsen, Habenicht, and others; the second illustrates the enormous working power of this unique personage, containing a list of his publications no less than 44 pages in length.

As a book of reference on a very interesting and little known phase of geographical life in Germany, the book is a very meritorious addition to the history of modern geography. MARTHA KRUG GENTHE.

NOTES ON THE DESCRIPTION OF LAND FORMS.—VII.

GEOGRAPHICAL DESCRIPTIONS AS REFLECTIONS OF PREPARATORY EQUIPMENT. An observer ordinarily sees most distinctly and describes most definitely the kinds of things that he already knows most familiarly. This principle has two important corollaries:—first, that the intending observer will do well, before setting out on his travels, to extend his preparatory equipment as far as possible, so as to become familiar with many kinds of things and thus be ready to recognize them at sight; second, that he will do well, when his travels are under way, to give particular attention to the things that do not readily find mental counterparts in his preparatory equipment, for these things may be novelties of special value.

It is instructive, when one reads the description of a distant region, to bear this principle and its corollaries in mind, with a view of discovering the schemes of treatment in which the observer had been previously instructed, and of determining the sufficiency of these schemes for the presentation of the facts that lay before him.

THE ARGENTINE CORDILLERA. F. Kühn. Beitrage zur Kenntnis der Argentinischen Cordillere zwischen 24° und 26° südl. Br. (*Zeitschr.* Gesellsch. für Erdk. Berlin, 1911, 147-172). The difficult journey over the desert highland basins of the Andean Cordillera between Salta in northwest Argentina and Taltal on the Chilean coast offers rich opportunity for the observation and description of a great variety of landscapes, many of which are clearly set forth, for the most part in explanatory terms, in the article above cited. Particularly interesting is Kühn's clear exposition of the striking contrast between the deeply

incised eastern slope of Atlantic drainage, and the many saline basins among the irregular ridges of the lofty interior highland. The eastern slope is characterized by erosional valleys; the highland is frequently occupied by aggradational plains. The eastern valley system that was ascended by Kühn has an open longitudinal stretch (Calçachi valley) discharging southward, with narrower transverse valleys joining it from the west. The longitudinal stretch (3,000 m.) has been aggraded, probably by glacial outwash (?), and now shows two or three terraces, of which the lowest one is 80 m. above the stream, its scarp being much dissected by lateral gulches (barrancas). One of the transverse branch valleys, descending from the southern side of the Nevado de Cachi (6,000 m. +), has been glaciated: it heads in a cirque (4,700 m. ?), below which the floor of the glacial trough has a steep rock step; farther down stream the valley is encumbered with moraines (4,350 m. ?) and by a multitude of erratic boulders (3,400 m.). Another transverse valley, drained by an ungraded stream, shows several alternations between deep-cut, narrow, rock-walled gorges, and more open portions in one of which landslides occupy the valley floor (as if the rock resistance varied along the valley course?); but in its upper part this young valley is continued in a lofty and broadly open trough (4,500 m.) of gentle northward ascent, bordered by broad, round, waste-covered ridges. A lava stream from an unvisited vent to the north lies on the trough floor. To the west, a waste-covered saddle (4,950 m.) affords passage to the interior highland.

The highland, at a general altitude of some 4,000 meters, is a region of ridges and basins; the waste that is removed, chiefly by arid weathering, from the ridges goes to aggrade the basins and hence to diminish the local relief. Stony gravel fans, shown on the route map to be frequently laterally confluent, descend from a high eastern range and stretch in long gentle slopes across a longitudinal depression toward the lower ridges within the highland. The saline mud plains of the basins are described in some detail. Volcanoes and lava flows of recent eruption are abundant, especially along the western border of the highland. The few pasture grounds in the highland are important stopping places for the cattle that are driven over from the Argentine pampas to the lowlands of Chile.

All the physiographic features here mentioned are evidently examples of kinds of things previously known to the observer; and they are very effectively set forth in terms that had become familiar to him by previous study. It is indeed interesting to note how well the terms that he employs appear to serve their purpose. But there are two large questions raised by the facts as thus presented, to which no explicit answer is found in Kühn's article:—one is the possibility that the Cordillera is a two-cycle mountain range; the other concerns the stage in the arid cycle now reached by the highland basins. The impression gained after a careful reading of Kühn's pages is that these questions remain

unanswered, not because they are unanswerable, not even because their answer is particularly difficult, but because the questions themselves were not raised in the observer's mind; in other words, because the systematic treatment of two-cycle mountain ranges and the theoretical scheme of the evolution of arid regions were not parts of the observer's preparatory equipment.

As to the one- or two-cycle origin of the Cordillera:—its highlands are described as occupying a zone that has suffered folding in combination with powerful upheaval. The ranges often exhibit the most beautiful folded structure (*die schönsten Faltengebirge,* p. 165); but the original surface of deformation is no longer visible, because the ridges have shed their waste to aggrade the depressions. This might be taken to imply that the ranges of the highland were not far advanced in the cycle of erosion that was initiated by the folding of their strata. On the other hand, the rounded, waste-covered ridges that border the lofty, gently sloping, broadly open trough, above the narrow, deeply incised young gorge of one of the eastern transverse valleys, strongly suggests the two-cycle origin of the highlands; the earlier cycle apparently having been initiated by strong deformation, and having advanced during a lower stand of the region far towards old age, before it was interrupted by a broad uplift, with undetermined warping and faulting, whereby the current cycle, now in an early stage, was introduced. This interpretation is supported by what Keidel has reported of other parts of the Argentine Cordillera, and Bowman of the Bolivian. Yet the reader must hesitate to decide definitely in favor of the two-cycle origin of the Cordillera hereabouts, because such an origin is not explicitly announced by the observer; and it is notoriously dangerous to extend an observer's conclusions beyond the reach that he gave them himself.

As to the stage of the arid cycle represented by the highland basins, the reader must again remain in doubt. True, it is clearly set forth that the basins are gaining at the expense of the ridges; that certain valley floors slope two ways from a valley-floor divide; and that there are several independent salt plain basins, as is shown on the neatly drawn route-map. Thus the basins would seem, as a whole, to be in the early stage of arid evolution, represented by many separate initial basins, each of which receives centripetal inwash from its more or less modified initial drainage area; but whether a later stage is here and there attained, involving the incipient integration of arid drainage by the delivery of waste from higher, well-filled basins across low divides to lower basins, accompanied by the trenching of the divides, cannot be made out, interesting as actual examples of this hypothetically inferred stage of evolution would be. This phase of the problem of the arid cycle does not seem to have been presented as a subject for the observer's inquiry; hence his descriptions do not suffice for its safe solution. Another phase of the same problem here encountered is that of the exportation of dust from the interior area by wind action. The wind on the highland is described as prevailingly brisk; wind-

carved rock ledges are mentioned; facetted pebbles are noted on the gravel plains; but dunes are said to be of rare occurrence. In view of the strong relief of the highland borders, and of the way in which the saline mud plains seem to be rising upon the flanks of the ridges that enclose them, the reader may infer that the wash of waste into the basins, aided by the binding action of hygroscopic salts in holding the inwashed waste, prevails over the exportation of dust by the winds, as might be expected by the case in the early stage of the arid cycle already indicated by the occurrence of independent basins; but here again, a word or two in expression of the observer's opinion, based upon what he saw and thought while on the ground, would be a valuable support for a reader's inferences.

Still a third phase of the evolution of a high-level, interior arid highland is passed over without explicit consideration; namely, the stage of encroachment of exterior on interior drainage. The hypothetical aspects of this part of the problem are clear enough: the exterior streams must cut their valleys headward by retrogressive erosion, and must eventually encroach upon the original high-standing interior drainage area. One by one, the interior basins will be captured by exterior streams; their aggraded waste-plains will be rapidly dissected and removed, and their rock floors will be attacked. Some of the high-standing basins of southern Tibet and of western Mexico seem to have been thus invaded by the retrogressive headwaters of exterior rivers; but in Tibet and Mexico as well as in the Andean Cordilleras, the accounts by various observers still leave too much of the story to the imaginative inference of their readers. Yet it would evidently be an aid to a reader who wishes to form a clear picture of an interior highland to know definitely whether the attack of the retrogressive exterior streams is as yet only in so early a stage that the capture of interior drainage is a remote contingency—as would seem to be the case in the district traversed by Kühn; or whether the initial divide around the rim of the interior area has already here and there been pushed inward a little by some of the more aggressive exterior streams; or whether the encroachment has gone on so far that some of the basins are in imminent danger of capture and diversion to exterior drainage systems; or whether some captures have actually taken place, and if so, what advance has been made in the rapid dissection of the waste-plains; for if these stages are correctly interpreted by the observer and correspondingly understood by the reader, the various features that are associated with each stage and implied in its mere mention will go far in enabling the reader to conceive what the observer actually saw. But at present the generalized problem of the cycle of arid erosion is so seldom recognized or taught, that the observers who travel in desert highlands have not yet had opportunity to acquire an understanding of it as part of their preparatory equipment; and various theoretical phases of the arid cycle therefore remain as yet unmatched by their actual counterparts.

It is important to emphasize a certain aspect of the systematic and explanatory treatment of land forms, here advocated. It should be carefully recognized that the object of determining the earlier stages in the history of a mountain range, or the later stages in the history of a highland basin, is not simply in order to know the past condition of the one, or the future condition of the other, but in order better to describe their present condition. The past condition of an existing mountain range is truly in itself an interesting matter for geologists; the future condition of an existing highland basin is also in itself an interesting subject for speculation, though no name has yet been given to the prophetic science to which such a speculation would belong. Why it is that the present form of both the mountain range and the highland basin—a proper subject of geographical study—can be better understood if it is described in terms of the past or the future forms, instead of in terms of itself, will be pointed out in a future Note.

GRUNDZÜGE DER OBERFLÄCHENGESTALTUNG CORNWALLS. H. Spethmann. (*Globus,* xciv, 1908, 329-333, 347-350). This discriminating article describes the upland, the valleys and the coast of Cornwall with greater fullness and with clearer appreciation of modern physiographic methods than does any English article that has come to my attention. The discussion of the means of distinguishing between two possible origins of the upland—as a peneplain of subaerial erosion, now uplifted and submaturely dissected, or as a plain of marine abrasion, similarly uplifted and dissected—is an unusually careful piece of work, revealing elaborately developed theoretical schemes of normal and marine cycles of erosion as a part of the observer's equipment. He concludes that the upland in the Lands End district is a plain of marine abrasion, because the subdued granitic residuals which surmount it do not occupy the whole of the granitic areas; this conclusion being preceded by the explanatory inferences that, if the upland were of subaerial erosion, the borders of the residual elevations ought to coincide with the boundaries of the harder rocks, while if it were of marine abrasion, the border of an unconsumed island might lie well within the boundary of the harder rocks, and might, because of the selective progress of marine abrasion, be very irregular in its alternation between headlands and coves.

These inferences and the conclusions to which they lead afford occasion for emphasizing another general principle of geographical description, as important as the one stated at the beginning of this number of these Notes; namely, that the observer and his readers must have identical or at least similar equipments, if the reports of the former are to be easily understood and fully accepted by the latter. A difficulty arises in the way of accepting some of Spethmann's results, because certain late stages in the marine and the normal cycles of erosion may be conceived differently from his conception of them, as follows:—First, a residual or monadnock surmounting a peneplain (for which

Spethmann suggests the convenient German term, *Härtling*), in a late stage of an undisturbed cycle, may occupy the whole area of the hard rock that determines it, as in the upper block of Fig. 1; but in a still later stage the border of the monadnock may shrink within the boundary of its hard rocks, as in the lower block; and in thus shrinking, many minor irregularities may be developed in its border by reason of slight inequalities in its structure. Hence irregularity of outline and lack of coincidence between the base of a low monadnock and its hard-rock area should not at once be taken as indicative of the marine origin of the surrounding plain.

Second, a residual island may be reduced to a smaller area than that of the hard rocks which determine its survival in an advanced stage of a marine cycle, but its border must then have a simple outline, free from narrow coves between headlands, because such details are produced by wave attack only in the early stages of the marine cycle; they must disappear in the stages so advanced that the island is subdued to low relief by normal erosion, for selective marine attack is then prevented by the presence of a well-developed beach along the far-retrograded shore line. The facts reported by Spethmann would, therefore, according to my interpretation, reverse his conclusion:—the upland about Lands End may be regarded as of subaerial origin, and the gravels that lie on it, bearing marine fossils, may be regarded as the result of a short-lived submergence after the district had been reduced to low relief by normal erosion.

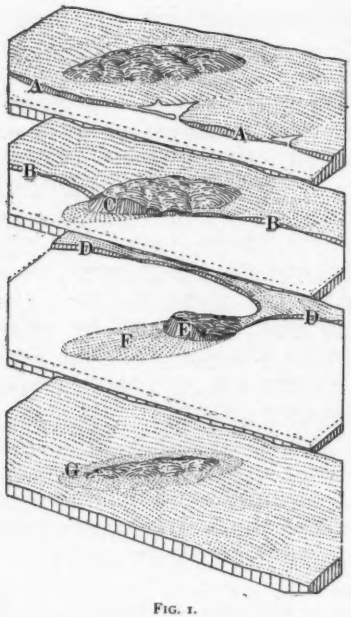

FIG. 1.

There is another means of discriminating between plains of marine and of subaerial degradation, to which little if any attention has been given. If a region of complex structure is attacked by normal and by marine agencies, the marine agencies being aided by a slow depression of the region during their advancing work, then when a monadnock is reached, it will come to form a headland with higher cliffs C, Fig. 1, than those on the weaker rocks near by, B, B. As retrogression of the cliffs continues, the headland will become a peninsula, with cliffed front, E, and a sloping back. If at either of these

stages, elevation should occur, the surface of the greater part of the marine plain, abraded on the less resistant rocks (unshaded in Fig. 1), would be more nearly level than the small part of it which slopes forward from the cliff of the partly destroyed monadnock across the abraded part of its hard rock area. This is more clearly seen in the larger scale of Fig. 2, where A,A represents

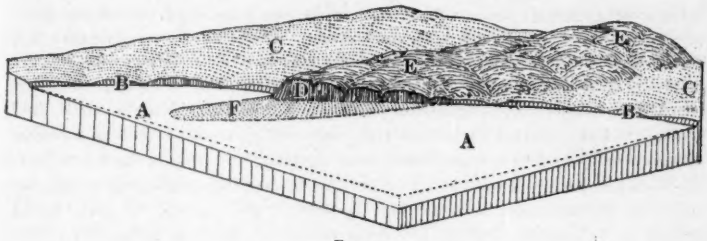

FIG. 2.

the smoothly abraded marine plain; B,B, the low cliffs along the border of the peneplain, C,C; and D, the higher cliffs at the front of the promontory formed by the exposed part of the monadnock-ridge, E,E. Of all these features, the abraded slope F, beveled on the hard rocks of the monadnock, is one of the most significant; its declivity will be about as much steeper than that of the plain, A,A, as the retreat of the higher cliffs, D, is slower than that of the lower cliffs, B,B. Even if no slow submergence accompanies marine abrasion, both the marine plain and the beveled slope must decline gently towards the sea; for the first abraded, outer part of a marine plain will be worn down somewhat while the sea retrogrades the coastal cliffs some miles into the land.

The upshot of this is, that if an upland is described as an uplifted plain of marine abrasion, features such as are shown in Fig. 2 ought to be identified along its inner margin, and especially around the exposed borders of its former headlands and islands. If no such features are found, and if instead the residual reliefs slope gradually down to the neighboring upland surface, with their base at the border of the determining hard-rock area, as in the upper block of Fig. 1, or shrunk inside of the boundary, as in the lower block, then the upland is better described as an uplifted peneplain of normal erosion, even if marine gravels, suggesting a temporary submergence, lie here and there upon it.

W. M. DAVIS.

GEOGRAPHICAL RECORD

AMERICA

THE TOPOGRAPHIC MAP OF NEW YORK STATE. The U. S. Geological Survey has just issued the Antwerp Quadrangle. There have now been published 231 survey sheets of areas in this State. The topographic survey of the State, now very far advanced, has been carried on by the State Engineer's Office and the Federal Survey, each institution paying one-half the expenses of the field work.

During August the topographers of the U. S. Geological Survey made field surveys of 6,517 square miles in various parts of the country, the area surveyed ranging from swamps to high mountains.

WORK ON THE PANAMA CANAL. The total of canal excavation up to Sept. 1, according to the *Canal Record* (Vol. 5, No. 3), was 148,192,759 cubic yards, leaving to be excavated 47,130,620 cubic yards, or less than one-fourth of the entire amount for the completed canal.

PANAMA CANAL ZONE LAND SURVEY. Field work on this Survey has been completed and the data are being collated in the Chief Engineer's office at Culebra. Data have been procured for a general topographical map of the entire Zone except the land that will be covered by water from Gatun and Miraflores Lakes. All the principal ridges, water courses and trails have been located and surveyed, and the maps will show the principal physical features of the country. (*Canal Record,* Vol. 5, No. 3.)

AFRICA

FRENCH MILITARY RECONNAISSANCES IN THE SAHARA SOUTH OF MOROCCO. During the winter of 1904-05, Capt. Flye-Sainte-Marie of the French Army led an expedition into the region lying south and southwest of the oasis of Tuat (27½° N. and 0°) in order to put an end to the depredations of the tribesmen of southern Morocco, who were in the habit of raiding caravans, especially the salt caravans from Taodeni (22° N. and 3½° W.), on the route from Morocco to Timbuktu. Recently our knowledge of the region lying to the north of that traversed by Capt. Flye-Sainte-Marie has been considerably extended as the result of a similar expedition commanded by Capt. Cancel. The field of operations lay almost entirely in hitherto unexplored territory, the names of some of the springs of which alone were known. The region traversed lies between 29½° and 27½° N. and 5° 10′ and 2° 10′ W. In the southernmost point reached, the spring Boubout, the route touches that followed by Capt. Flye-Sainte-Marie's expedition. Several hitherto unknown springs and pasturages were discovered which will prove important to the caravan trade. The distribution of *erg* (sand desert) and *hamáda* (stony desert) was mapped, and the position was determined of the sand dunes in the Erg Igidi and the Erg Shesh, the two main sand deserts of the western Sahara. Positions were determined astronomically, and meteorological records were kept. (*Pet. Mitt.* Vol. 57, II, p. 150, 1911, based on *Rens. Colon.*, No. 7, pp. 167-178, 1911, with map [listed in *Bull.*, Vol. 43, p. 877]).

BOUNDARY BETWEEN LIBERIA AND THE IVORY COAST. The boundary between Liberia and the French Ivory Coast has been defined by treaty, signed at Paris on January 13, 1911. Capt. Schwartz of the French Army, who served on the Dahomey-Togo boundary commission, was appointed as the representative of the French Government. He left Bordeaux on June 2 and will meet the other members of the commission in Konakry, French Guinea. (*Pet. Mitt.*, Vol. 57, II, p. 150, 1911.)

THE DUKE OF MECKLENBURG'S EXPEDITION IN AFRICA. Duke Adolf Friedrich of Mecklenburg, who in 1907-08 made a very successful journey of exploration in the region of the Virunga Volcanoes and the Great Lakes of Central Africa, has ended his travels of the past year. His party was divided into three sections. The Duke led one of them into the Lake Chad region, crossing the lake from north to south. On Feb. 27 this year his detachment traveled south of Lake Chad into Bagirmi, and on the way he met Gaourang, the Sultan of that country, traveling north to pay his respects to Col. Larjeau, Commander of the Military Territory of the Chad. The French are now building a good wagon road between Fort Lamy and Tchekna, the capital of Bagirmi, and next year they expect to connect the two points by telegraph. All the buildings in Tchekna, even those of the Sultan, are made of straw thatch, and matting forms the partitions between the rooms. The town is surrounded by a high wall of baked clay many feet in height. It has about 10,000 inhabitants. Leaving Tchekna on March 29 the Duke arrived on June 12 at Lokoja, at the confluence of the Niger and Benue. From the Gulf of Guinea the Duke visited the German colony of Togo. He expected to return to Germany about the end of August.

The second detachment, in charge of Dr. Mildbraed and Dr. Schultze, worked in the southern part of Cameroons and are expected to return to Germany in October.

The third detachment, under command of Lieutenant von Wiese and Kaiserwaldau, were detailed for scientific research in the region of the upper Ubangi and of the upper Nile. They arrived on April 1 at Yakoma, a Belgian post at the confluence of the Welle and Bomu Rivers, which together form the Ubangi. They visited the Belgian station of Banzyville on the Ubangi R., a post of superior situation and construction. The houses not only of the Europeans but also of the black soldiery and the workmen are very neatly kept, and many rows of palm trees have been set out in the streets of the settlement. Stretching away from the station, as at most of the Belgian posts, are large rubber plantations.

Leaving Banzyville on May 15 the party crossed the country of the Basa and Baseri. Beyond this region the country is almost without inhabitants, as sleeping sickness has frightened away nearly all who survived its ravages. The Yakoma who live in the large territory surrounding the post of that name are a people of superior intelligence and great industry whose specialty is working in iron. Their products include lance points, knives, razors, etc. Unfortunately sleeping sickness has made great inroads among them, and the Government hospital in the town is continually filled with patients. The species of the tsetse fly that is fatal to live stock is not found in this part of the Belgian Congo. The Government and the people own great herds of cattle. The Government also has at the station forty breeding mares which, with their colts, are in excellent condition. On April 10 this detachment continued its journey towards the Nile, traversing the Bira and Dendi countries. It expected to reach the

Nile by its Bahr-el-Ghasal tributary and then descend the Nile to Khartum on the way home.

GEOLOGICAL EXPEDITION TO THE EAST AFRICAN RIFT VALLEYS. Dr. E. F. Kirschstein, who accompanied the expedition of Duke Adolf Friedrich of Mecklenburg across Africa as geologist, is soon to undertake an independent expedition, the object of which is to study the structure of the two great rift valleys of eastern Africa. He will start from Portuguese East Africa, which has hardly been examined geologically, and will then turn to Lake Nyasa, devoting especial attention to the volcanoes of the Konde district at its northern end. He will then remain for some time in the region between Lakes Nyasa and Tanganyika, where he will examine the Rukwa depression. From here he will proceed to study the western of the two drift valleys in which lie Lakes Tanganyika, Kivu, Edward and Albert. This will lead Dr. Kirschstein to the scene of his former labors, the volcanoes lying north of Lake Kivu, and will afford opportunity for more detailed study. The expedition is planned to last two years. (*Pet. Mitt.*, Vol. 57, II, p. 151, 1911.)

GERMAN EAST AFRICA EXPEDITION OF THE HAMBURG GEOGRAPHICAL SOCIETY. A letter from the leader of the expedition, Dr. E. Obst, dated June 27, 1911, reports that he had spent five weeks in the land of the Wakindigas near Lake Nyarasa (3½° S. and 35° E.). This people is not a race of pygmies, as supposed. They are of normal stature and of Bantu somatic type. Their language abounds in clicks. They number about one hundred, all told. Geological trips included a visit to the Wembäre depression, and observations were made of its mud volcanoes and the dust storms which occur there daily. (*Pet. Mitt.*, Vol. 57, II, p. 151, 1911.)

ASIA

PROF. MACHATSCHEK'S EXPLORATIONS IN TURKESTAN. During April and May Prof. Machatschek of the University of Vienna has been engaged in exploratory work in Turkestan. Up to the end of May he had completed two trips. The first led from Tashkent up the Chirchik River to Khojakent, where it emerges from the western outliers of the Tian Shan. Following along their base in a southerly direction he reached Khojent on the Syr Darya, which commands the entrance to the basin of Ferghana. From here he proceeded to the east along the southern border of the Chaktal Tau which is fringed with irrigational oases where the larger mountain torrents emerge upon the arid plain lying at its foot. Because of an accident to his companion, Prof. Machatschek was forced to return to Tashkent prematurely. On his second expedition, lasting from May 10 to 25, he followed the post road to the north to Chimkent. Continuing to the N. E. up the headwaters of the Aryss River he reached the classic ground of Central Asiatic exploration where the axis of the Kara Tau diverges to the N. W. from the main range of the Ala Tau with its W. N. W. trend. On his return to Tashkent Prof. Machatschek followed a more easterly route. Shortly after, he started on a third expedition to explore the main range of the Chaktal Tau with a view to elucidating its age and the extent of its former glaciation. At the same time Prof. Machatschek is collecting material for a general geologic map of the western Tian Shan. (*Mitt. Geogr. Gesell. Wien*, Vol. 54, pp. 404-405, 1911.)

JAPANESE IMPROVING THEIR LIVE STOCK. An interesting phase of the economic

development of Japan is the attention that is now being given to the improvement of cattle and horses. Tourists have often observed the scarcity of live stock on Japanese farms. Until recently the Japanese peasants have raised cattle chiefly for draft purposes, not for meat. Europeans in Japanese cities have complained of the scarcity and poor quality of the beef supply. This situation is gradually improving. The Japanese government ("Outlines of Agriculture in Japan," Agric. Bur., Tokyo, 1910) has sent some of its best students of live stock husbandry to this country to study the industry. Some of the best herds of dairy cattle in the United States are now furnishing superior animals to Japan to become the foundations of new herds there. The Japanese have been chiefly fish and rice eaters, but their Government is now recognizing the importance of meat in their diet, and hereafter the live stock industry is to be especially fostered.

Count Okuma in his "Fifty Years of New Japan" (Dutton, New York, 1909), said also that the Government was beginning to do everything in its power to improve Japanese cattle and horses. "Besides Government pastures in which the choicest cows and oxen are kept for breeding purposes, Government officials are sent yearly to Europe and America to purchase prize cattle there so that the native strains may be improved and the agriculturists may be supplied with them." The Government is importing stallions, which are hired out for breeding purposes to farmers at large. In the extensive tracts of pasture land belonging to the Imperial household, cattle and horses of fine quality are now raised, and a number of them are disposed of yearly to farmers for the betterment of the stock. A plan has been formulated for the examination of breeding horses and cattle in order to eliminate those which are not up to a recognized standard.

AUSTRALASIA AND OCEANIA

Dr. F. Speiser's Ethnological Investigations in the New Hebrides. Dr. F. Speiser has submitted to the Berlin Anthropological Society a first report on his ethnological investigations in the New Hebrides. He began his work on Espiritu Santo, the largest island of the group. On its eastern coast he found the aborigines to be of large stature. They are on the verge of extinction. The mountainous interior of the island Dr. Speiser found inhabited by a race of small stature whose stock is no longer pure. Approaching the west coast he found increasing evidence of admixture with Polynesian blood. After a trip to Nouméa, New Caledonia, where he met Dr. Sarasin, Dr. Speiser returned to the New Hebrides to extend his investigations to other islands of the group, Api, Ambrym, Arbe, etc. (*Pet. Mitt.*, Vol. 57, II, pp. 152, 1911.)

Capt. Koch's Explorations in Western New Guinea. Capt. K. F. Koch, of the Dutch Army, has been exploring the peninsular region of western New Guinea. From Argoeni Bay on the south coast, in 3° S. and 133½° E., he crossed over hills attaining 1,500 ft., followed by swampy districts, to MacCluer Gulf, which he reached near its eastern end at Narënas, at the mouth of the river of the same name. From here he crossed the narrow isthmus lying between MacCluer Gulf and Geelvink Bay, reaching the latter at Windesi. His route, therefore, lay to the south of that followed by Moolenburgh in 1902 and by the Swiss geologist Hirschi in 1906, both of whom had crossed the isthmus at its narrowest part, where it measures only seven miles. After leaving

Windesi, Capt. Koch examined Wandammen Bay, which indents the western shore of Geelvink Bay, and thence returned westward across the isthmus farther south than by his previous route. This involved crossing an abrupt ridge 2,500 ft. high, on whose western flank he reached Koeri Brook, a tributary of the aforementioned Naremas, which he followed to MacCluer Gulf. (*Pet. Mitt.*, Vol. 57, II, p. 152, 1911, based on *Tijd. Kon. Ned. Aardr. Genoot.*, Vol. 20, p. 712, 1911.)

EUROPE

THE ERUPTION OF ETNA. On Sept. 10 earth tremors were recorded at Mineo, a village thirty-five miles southwest of Etna, and for more than fifteen hours slight shocks or tremors were almost incessant. Then followed for twenty-four hours a period of calm interrupted by only one slight disturbance. Tremors were also felt at Linguaglossa, ten miles N. E. of the central crater, but the disturbances gradually became so infrequent and slight that the inhabitants felt little anxiety.

About the time the first tremors were observed black clouds of vapor and volcanic dust were seen to rise from Etna. A new vent was opened at 4.30 A. M. on Sept. 10 on the northern side of the mountain to the N. W. of M. Frumento at a height of about 9,300 feet; a second vent opened at 9.40 A. M. in the neighborhood of M. Nero still further north. Both vents were opened an hour or more after pronounced shocks had occurred and from both openings there issued dense clouds with lapilli, sand and ashes but no lava.

At 12.15 P. M. of the same day a third vent appeared near M. Crozza and still later a fourth near the town of Castiglione Sicilia beyond the northeastern foot of the mountain. Other new vents then opened in rapid succession. There were sixteen in action on Sept. 11, fourteen of which ejected vapor and dust, and the other two, lower down, poured forth lava. On Sept. 13, Prof. Riccò reported that as many as fifty-four vents had opened in the region between M. Rosso, N. N. E. from the summit and about six miles from it, and the craters formed in 1879. The central crater also ejected an immense quantity of ashes covering the surrounding country to a depth of several inches.

There seems to have been no outpouring of lava on the first day; but at 1.30 A. M. on Sept. 11 when there was comparative seismic calm, a new vent opened between M. Rosso and M. Nero at a height of about 5,250 feet, with enormous emission of dust, etc., followed by a stream of lava.

A copious stream of lava issued five hours later from another vent which opened in the same district. The lava streams rapidly descended the steep slope, passed around M. Rosso and then between the lavas of 1646 and 1809, thus assuring the safety of Linguaglossa. The main stream presented a front from twelve to fifteen yards high and from 500 to 600 yards wide. It advanced rapidly, sometimes at the rate of a quarter of a mile an hour, but during the next two or three days its velocity was reduced. By Sept. 13 it had crossed the carriage road and the railroad which passes around the lower slopes of the volcano. On the next day it had approached to within two miles of the Alcantara River which forms the northern boundary of the volcano. On the fifteenth the main stream of lava split into four subsiduary streams and the violence of the eruption perceptibly abated. On Sept. 18, however, the lava stream made another onward movement, but from that time activity rapidly subsided. Prof. Ponte, the vulcanologist of Catania, says that this eruption of Etna was five

times greater than that of 1910 and that more lava was ejected in six days than during the twenty-six days of the disturbance of last year. Some time will probably elapse before a detailed scientific description of the eruption will be available.

PETROLEUM INVESTIGATIONS IN HUNGARY AND RUMANIA. In consequence of the discovery of large quantities of natural gas in Transylvania, the Hungarian Ministry of Finance has commissioned Prof. Lóczy, Director of the Hungarian Geological Survey, and Dr. H. Böckh, professor of geology at the School of Mining and Forestry in Selmeczbánya (Schemnitz) to examine the region with regard to the occurrence of petroleum. With the permission and support of the Rumanian Government the commission is first studying Rumanian oil fields in order to be able to determine by analogy whether the presence of natural gas in Transylvania is indicative of the presence of petroleum in sufficient quantity to justify exploitation. (*Pet. Mitt.*, Vol. 57, II, p. 150, 1911.)

POLAR

PROJECT OF A SPANISH POLAR EXPEDITION. At the meeting of May 7 a plan for a Spanish polar expedition was submitted to the Royal Geographical Society of Madrid by F. J. Gisbert, who is familiar with Arctic conditions from former expeditions. Basing his plan on Nansen's voyage in the *Fram* Señor Gisbert intends to make use of the trans-polar current, starting, however, from a point much farther east, north of the Alaskan coast, in 160° W. long. He counts on three years for the drift to the Greenland Sea and plans to take provisions for five years. Side trips are to be made on sleds which will allow of exploring to a distance of over 100 miles from the ship's position. The cost of the expedition is estimated at $125,000. A committee has been appointed by the Madrid Geographical Society to examine the project and report as soon as possible on its feasibility and the probability of securing the necessary funds. (*Bol. R. Soc. Geogr.*, Vol. 8, pp. 287-292, Madrid, 1911.)

NORWEGIAN EXPEDITIONS TO SPITZBERGEN. Dr. Reusch of the University of Christiania sends the following information concerning expeditions to Spitzbergen to the *Geographische Zeitschrift* (Vol. 17, pp. 346-347, 1911): A. Hoel of the Geological Survey of Norway and Lieut. A. Staxrud were to conduct an exploratory expedition to Spitzbergen during the past summer, which is to be continued during the summer of 1912. The funds were furnished by the Norwegian government and by private subscribers. A geological examination was to be made of the unsurveyed areas of the northwestern peninsula of West Spitzbergen, enclosed between Wijde Bay and Klas Billen Bay, the northeastern extremity of Ice Fiord, and of the peninsula lying between Ice Fiord and Bell Sound. Photo-topographic surveys were to be made during the past summer of the region lying east of a line connecting Green Harbor and the Fridthiof Glacier on the latter peninsula. The results will be published on a map on the scale of 1:50,000. Several of the trigonometric points determined by the Isachsen expedition in 1909-10 were to be used.

In the summer of 1912 the expedition is to extend its topographic survey to the north of Ice Fiord. The geological investigations will primarily be devoted to an examination of the volcanic district discovered in 1910 near Wood Bay on the northern coast. A special study will be made of the Devonian formations with a view to correlating the Upper Devonian of Mimers Bay with the Lower

Devonian of northern Spitzbergen. The Carboniferous and the dynamo-metamorphic rocks east of St. Johns Bay and between it and Ice Fiord will also receive special attention. The mapping of morainic terraces and the measurement of the rate of movement of the Lilliehöök Glacier will be continued. A detailed survey will be made of several of the glaciers discharging into Cross Bay.

The members of the expedition are divided into four parties of three persons each, two parties being made up of geologists, two of topographers. The former are led by Messrs. Hoel and Holtedahl, the latter by Lieut. Staxrud and A. Koller. All four are experienced men who have already taken part in two or more Spitzbergen expeditions.

A second expedition was sent out early in June by a merchant of Christiania to determine the existence of coal and ore deposits and incidentally to make observations of a geologic and geographic nature. The expedition is well equipped. It has the use of a small vessel with which both the east and west coasts were to be visited. The members were divided into two working groups, one consisting of the geographer B. Jakobsen and two men, the other of three students of mining engineering, R. Marstrander, K. Sörlie and H. N. Ellefsen. Messrs. Jakobsen and Marstrander have accompanied former expeditions.

The construction of a wireless telegraph station on Spitzbergen, permission for which was refused the American company exploiting the coal deposits at Advent Bay, has been undertaken by the Norwegian government itself. The station was to be completed in the autumn. This will end the regular isolation for eight months of a region which is now permanently inhabited.

Contributions to the Mawson Antarctic Expedition. Despatches from Australia on Sept. 13 announce that the Commonwealth Government will contribute $25,000, and the Government of New South Wales, $35,000, towards the expenses of Dr. Mawson's Antarctic Expedition. A number of citizens of Sidney have given altogether $22,500.

COMMERCIAL GEOGRAPHY

Commerce of the World in 1910. The value of the international commerce of the world in 1910 was 32,400 million dollars, which was greater than that of any preceding year and 50 per cent. more than in 1900. The wonderful progress foreign trade has made is clearly shown by the fact that the total value in 1910 is eight times as much as it was in 1850. More than half of all the imports and exports were into or from five nations—Great Britain, Germany, United States, France and The Netherlands. The imports of these nations amounted to 9,103 million dollars, or 54 per cent., and the exports amounted to 7,965 million dollars, or 51.5 per cent. of the total values. Germany increased both its exports and imports from 1900 to 1910 more than any other nation and each of the five leading commercial nations has a larger net increase than any other nation not one of the five.

During the six to eight months of 1911 for which statistics are available there has been an increase of trade in most countries. The ten leading importing countries increased their foreign trade over 400 million dollars. All increased their imports excepting Germany and the United States, and all increased their exports excepting Germany and Italy. The increase in the value of the exports from the United States shows that it has recovered from the

panic of 1907 and may soon regain its place as a close rival of Great Britain for first rank as an exporting nation. In the first eight months of 1911 the increase of exports of the United States was 150 million dollars more than that of Great Britain. These facts are taken from a paper by John J. Macfarlane on "Commerce of the World in 1910," printed in *Commercial America* (October, 1911), and illustrated by diagrams and tables.

PERSONAL

On the occasion of the celebration of the centenary of the University of Christiania in September honorary degrees were conferred on Prof. W. M. Davis and Dr. Charles D. Walcott.

Mr. Harlan I. Smith has been appointed Archæologist by the Governor General of Canada to conduct the Archæological Survey of Canada and have charge of the national archæological collections. His office is in the Victoria Memorial Museum, the national museum of Canada, at Ottawa. Mr. Smith, as American archæologist of the Jesup North Pacific Expedition, conducted archæological explorations in British Columbia which made him one of the best informed men on the antiquities of western Canada. This no doubt was the reason of his appointment. He has contributed to the *Bulletin* on archæological discoveries in Northwestern America, many of which were made by him in the Canadian part of that area. His work will include survey, research and the popular presentation in the museum of the serious facts of Canadian archæology.

Dr. Davis Starr Jordan has been decorated by the Japanese Emperor. Dr. Jordan is at present in Japan.

Dr. Eduard Suess, Professor Emeritus of Geology in the University of Vienna, has retired from the Presidency of the Vienna Academy of Sciences. He recently celebrated his eightieth birthday.

Captain F. Fraser Hunter, I. A., has been appointed Officer in Charge of the Surveyor General's Office, Calcutta, with the rank of Assistant Surveyor General. He is a native of Canada and spent several months last year in this city.

OBITUARY

General Strauch. General Strauch of the Belgian Army, who was appointed by King Leopold II in 1878 as Secretary General of the International African Association and who for twelve years was practically at the head of the management of Belgian interests in the Congo Free State, died in Belgium in June last at the age of eighty-two years.

Edward Whymper. This great mountaineer died at Chamonix on Sept. 16. A man of versatile talent, he was known as artist, engraver, explorer and mountaineer. He was born in 1840 and came into wide public notice as the first climber of the Matterhorn. Whymper first visited the Alps in 1860, when he was commissioned to make a series of sketches of Alpine scenery. One of the scenes he was to illustrate was the attempt, which proved unsuccessful, of Prof. Bonney and a party to ascend Mont Pelvoux, at that time believed to be the highest peak of the Dauphiné Alps. Whymper then became a mountaineer himself and reached the top of Pelvoux in the following year. He proved that Pelvoux was not the highest peak in Dauphiné but was slightly overtopped by a

neighboring summit which he climbed in 1864. It received the name of the Pointe des Écrins. Whymper's ascent of it was regarded as the most remarkable mountaineering feat up to that time. From 1861 to 1865 he was constantly engaged in mountain exploration, especially in the regions of Mont Blanc and the Pennine Alps. Meanwhile the Matterhorn was casting its spell over him, and he made a number of unsuccessful attempts to ascend it from the southwestern or Italian side. Then he turned to the eastern or Swiss side as the more hopeful route, and his final success came in 1865. There was both triumph and tragedy, however, in this great ascent, for four of his companions lost their lives. The story of all his Alpine ascents and explorations is told in his fascinating volume, "Scrambles among the Alps," published in 1871 and illustrated by beautiful drawings, most of them executed and some of them engraved by his own hand.

After the tragedy of the Matterhorn, Whymper's energies were mainly devoted to travels and explorations in a wider field. He undertook two expeditions to Greenland, partly for scientific purposes. He next went to Ecuador and in 1880 he added to his many conquests of virgin peaks by two ascents of Chimborazo, the height of which he determined at 20,498 feet. He also spent a night on the summit of Cotopaxi, the loftiest active volcano in the world, reaching, as he ascertained, the height of 19,550 feet. He spent considerable time (1901 to 1905) in exploring and ascending mountains in the Canadian Rockies and Selkirks, and these achievements practically closed his mountaineering career.

Pierre Emile Levasseur. Both geography and economic science have sustained a severe loss in the death, in France, of Prof. Levasseur at the age of 83 years. He gave most of his long life to demonstrating the importance of a right appreciation of geography in its application to man, and to the development of economic science. In 1863 he published a "Précis d'Histoire de France" and a "Précis de Géographie." In these and his many subsequent works he always aimed at the highest precision. He contributed, to an important extent, in building up in his native land a scientific type of geography and always insisted upon the educational value of the subject when so treated. His visit to the United States in 1893 resulted in an important work, "L'Ouvrier Américain" and, along the same line of investigation, he deduced important studies on the working classes in France up to the Revolution. A later work dealt with their condition under the Third Empire. He was long noted also as one of the leading statisticians of France, and in his work "La Population Française" he not only treated of the geographical aspects of the question but also dealt with it statistically and pointed out the proper use of statistics in all questions of applied geography. One of his excellent popular works was "Les Alpes et les Grandes Ascensions."

Erratum. An erroneous statement in the article "The Discoverer of the Philippines," (*Bulletin,* August, p. 591), requires correction. Speaking of the Marianas or Ladrone Islands, the article says that "they now constitute a province of the Philippines, the seat of government being at Guam, the largest island." The United States acquired Guam as a naval station, and Spain sold the remainder of the Marianas to Germany.

GEOGRAPHICAL LITERATURE AND MAPS

(INCLUDING ACCESSIONS TO THE LIBRARY)

BOOK REVIEWS AND NOTICES

(The size of books is given in inches to the nearest half inch.)

NORTH AMERICA

Nature Sketches in Temperate America. A Series of Sketches and a Popular Account of Insects, Birds and Plants, Treated from some Aspects of their Evolution and Ecological Relations. By Joseph Lane Hancock, M.D., F.E.S. xviii and 451 pp., illustrations and index. A. C. McClurg & Co., Chicago, 1911. $2.75. 9 x 6½.

The relation of animal and plant life to their natural surroundings is the controlling theme of this series of popular and suggestive essays brought together by Dr. Hancock in attractive form. The book is definitely planned to introduce the general reader and young student to the philosophy of evolution. To this end a brief discussion of the laws of organic evolution as accepted by the principal workers in the field of biological science to-day forms the introduction to each section, this being followed, in each case, by varied and interesting examples drawn from the author's observations afield, and illustrated by excellent photographs and colored plates. In view of the late utterances on protective coloring and the like from some of our poet-naturalists and recent travelers, Dr. Hancock's chapters on Protective Resemblances, Mimicry, and Warning Colors will be found interesting reading. The book should prove a treasure-house of information and suggestion to the teacher or parent who would lead the younger generation to a real contact with nature and to a realization of the oneness of all life. Its usefulness is increased by a list of the 225 illustrations, as well as by an excellent index and a list of classified habitats of various groups of Orthoptera with definitions of their environing formations.

C. W. HOTCHKISS.

AFRICA

In the Heart of Africa. By The Duke Adolphus Frederick of Mecklenburg. Translated by G. E. Maberly-Oppler. xx and 281 pp., maps and illustrations. Cassell and Co., Ltd., London and New York, 1910. 10 x 7.

One of the best books on any part of Africa in recent years. The expedition made a systematic investigation of the northwestern part of German East Africa, the Central African Rift Valley from Lake Kivu to Lake Albert and the northeastern confines of the Congo State. It was carried out under the leadership of the Duke of Mecklenburg in fourteen months (1907-08). The party had almost unequaled material supplies and a scientific staff of the best quality. The details of the scientific outcome are reserved for the volumes that are to follow this popular report of the work, but the book contains a good summary of the results. A marked feature of the expedition was the great extent and variety of the collections. Such a notable mass of important scientific material has seldom been collected in so short a time.

We find here the first extended account in English of Ruanda, an exceptional country in its ethnographical and geographical position. It is in the northwestern corner of German East Africa and was first described by Dr. Kandt in his admirable book "Caput Nili." The 1,500,000 people are still governed autocratically by a sovereign sultan, for German supremacy in Ruanda is recognized as yet only to a very limited extent. The Duke says that the greater part of Ruanda is finely adapted for colonization by whites who would find cattle raising, agriculture and other industries profitable. The cultivated soil bears rich crops and the climate is fresh and healthful. The high degree of civilization among the Watussi, the pastoral and dominant people, is assisted by the climatic conditions. The malaria-carrying mosquito does not exist there, and the country is the most thickly peopled region in Central Africa.

The expedition made a long sojourn in the regions of Lake Kivu and the Virunga volcanic area to the north of it. Notwithstanding Dr. Kandt's meritorious explorations it has remained largely a *terra incognita* until the present expedition made its detailed studies. The book gives a vivid idea of the volcanoes of which the western group is by far the most interesting. It was the scene of the recent outburst of Mts. Namlagira and Ninagongo. The illustrations include some striking views of these volcanoes in eruption. The eastern and central groups are each composed of three extinct volcanoes. Fifty-five pages are given to discoveries in this district.

The valley of the Semliki River and the great tropical forest, first revealed by Stanley during his Emin relief expedition, through which the Duke's party reached the Congo, are described with the same breadth and variety of information. This is a popular book in the best sense, for it is painstaking in behalf of accurate statement. The very fine illustrations were selected from some 5,000 photographs. The translation from the German is well done.

ASIA

Shans at Home. By Mrs Leslie Milne. With two chapters on Shan History and Literature by the Rev. Wilbur Willis Cochrane. xxiv and 289 pp., illustrations and index. John Murray, London, 1910. 15s. 9 x 6.

Earlier in the year there passed under review the third book which Sir James Scott has written under the title of "The Burman." Mrs. Milne, in her book, has followed his method of treatment and, wherever possible, has extended the incidents of his research into the somewhat alien and certainly ruder culture which has its seat along the upper streams of the Irawadi. Her experience was confined to the North Shan States, and her volume attempts no record of the South Shan States in the valley of the Salwin.

Engaged in linguistic studies Mrs. Milne spent twenty months of three successive years at Hsipaw and Namkham, and the book presents the record of her observation of the daily life of the people with whom she lived. The value of the record lies in the vividness of the note taking. What she saw, that she set down with picturesque attention to detail. The method has led to repetition, a slight defect which a little more care in editing could readily have removed. So, too, when the author essays in a few places to assign some of her notes to their place in general anthropology she is not always successful. But the notes themselves are a brilliant record, full where detail is instructive, clear with the utmost simplicity, above all else they are sympathetic. Almost nowhere does one encounter the superior attitude. Mrs. Milne is at no pains to draw a com-

parison between the Shan and the European, she does not even suggest that they are but a poor folk. Such as they are, living their own lives in the mud where the buffaloes wallow, just such as she saw them she has set them down in a most agreeable record. In these notes we are enabled to follow the Shan from birth to his appointed end through all the daily routine of recurring cares and joys.

Two chapters are contributed by the Rev. Mr. Cochrane, an authority upon the inner relations of the Shans. In reciting the past history of the people he touches rather too lightly upon a number of points over which controversy has been active and of which the solution has yet by no means been determined to the general satisfaction of such as make a study of the history of the folk of this nook of Asia who use the tonal languages. In the chapter on the language, however, he offers an excellent determination of the linguistic position of the people, and his examination of the alphabet displays great acumen.

WILLIAM CHURCHILL.

POLAR

The Voyage of the "Why Not?" in the Antarctic. The Journal of the second French South Polar Expedition, 1908–1910. By Dr. Jean Charcot. English version by Philip Walsh. viii and 315 pp. and numerous illustrations from photographs. Hodder & Stoughton, New York and London.

It is distinctly fortunate for all American and British readers who are interested in travel and exploration but who cannot read French, that Dr. Charcot's account of his last journey has been translated into English. The translation, by Mr. Philip Walsh, is thoroughly well done and may be relied on. The book is well printed on good paper; it has beautiful illustrations, some of which are new; and the only omission is that a special map was not prepared to go with it. The French Edition of this work was reviewed in the *Bulletin,* Vol. 43, pp. 81-90, 1911.

The greatest interest and importance to American geographers, perhaps, of Dr. Charcot's discoveries lies in the fact that they were made in the Antarctic continuation of the American continent. Up to the present time there were accessible to the general reader only two narratives in English of scientific expeditions to this Antarctic continuation of America. The first is Dr. Cook's journal of De Gerlache's exploration of Gerlache Strait and of the drift of the "Belgica" in the pack of West Antarctica: the second is Dr. Nordenskjöld's excellent account of his voyage to the South Shetlands, to Foyn Land, to King Oscar Land, and to Nordenskjöld Land. De Gerlache threw some light on the western coast of the northern mainland of West Antarctica to about 66° S. lat.; Nordenskjöld cleared up the geography of the eastern coast to about 67° S. lat. Beyond these points almost nothing was known, and we must turn to Charcot's book for further information.

Charcot's explorations extended along the west coast of the northern mainland of West Antarctica from the South Shetlands to the 70th parallel of south latitude and then due west along that parallel to about the 123d meridian of west longitude. His discoveries have clinched for physical geographers and geologists the important fact that the colossal range of mountains which, under the names of the Rocky Mountains and the Andes, extends from Alaska to Cape Horn, springs up again in the South Shetlands in 62° S. lat., and continues, through Palmer Land, Danco Land, Graham Land, Loubet Land and Fallières Land, beyond which it disappears into the unknown. Nobody will go in a boat

much further than Charcot in that quarter. Any advance will have to be made with sledges and dogs, and there is little probability of this being done for a good many years to come.

Whether this great mountain range, which may well be called the Antarctic Andes, continues towards East Antarctica or whether it turns westward to die out at the Great Ice Barrier, we do not as yet know. It is one of the few remaining great geographical mysteries. But thanks to Charcot, we can assume, almost to a certainty, that there is land further westward near the 70th parallel in about the 120th meridian of west longitude. And this new land, felt while sounding though not seen by Charcot, may belong to the same formation as the Rocky Mountains and the Andes.

It is possible that this problem may be solved by Charcot himself. For the *Pourquoi-Pas?* has been put in reserve, and if the necessary funds can be raised, as they probably will be, Dr. Charcot intends to start in 1912 to explore at least the coast of this unsighted land, crossing the Antarctic Ocean under sail, so as to reach the pack with his bunkers full of coal. Let us hope he will succeed in his next undertaking as well as he has heretofore. He has already forged many scientific links between America and Antarctica and may forge more. But in any case, American geographers should be grateful to Charcot for what he has already done and it is to be hoped that "The Voyage of the *Why Not?* in the Antarctic" may bring him many friends in this country.

EDWIN SWIFT BALCH.

EDUCATIONAL

A Geography of Ireland. By O. J. R. Howarth, M.A. The Oxford Geographies. Edited by A. J. Herbertson. 224 pp., 47 maps, illustrations and index. Clarendon Press, Oxford, 1911. 2s. 6d. 7½ x 5.

In many respects an island is a most convenient unit for detailed geographical study. This excellent volume certainly justifies that statement. In the physical, historical and economic treatment of the topic, the book is one of the best, thus far, of the Oxford geographies. The student or reader, in Part I, is enabled to learn and account for the structure of the chief physical divisions of Ireland. In Part II his attention is directed to the details of topography and regional description. Human geography is studied in Part III, the book closing with studies of the population, products, agriculture, manufactures and communications. The maps are good but supplementary to larger atlas sheets.

Europe. By H. J. Snape, M.A. Blackie's Causal Geographies Regionally Treated. 190 pp., 6 colored plates, maps, profiles and index. Blackie & Son, Ltd., London, 1911. 2s. 7½ x 5.

This book is one of the results of the excellent influence of the Geographical Association and the Oxford School of Geography upon the methods of teaching the subject in Great Britain. An introductory chapter emphasizes the geographical relationship of Europe and Asia. The comparative method is used throughout. For example, in treating the climate of the British Isles attention is called to the strong resemblance, on a small scale, of the British climate to that of Europe. The book is fairly representative of the great improvement in the methods of treating geographical topics. Considerable emphasis is given to the influence of geographical factors on history. Some of the numerous maps and diagrams are in colors.

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NEW MAPS

EDITED BY THE ASSISTANT EDITOR

System Followed in Listing Maps.

Title. As on original, if possible. If lacking or incomplete, necessary matter enclosed in brackets.

Scale. Natural (unless otherwise on original), followed by equivalent in miles to one inch. If no scale on original, approximate scale enclosed in brackets.

Coordinates. Approximate limiting coordinates of map given. Where map-net lacking, coordinates, if possible of determination, given in brackets. All meridians referred to Greenwich. If map not oriented N., orientation given.

Colors. Number of tints of separate symbols, not number of color printings given. Black or basal color not considered a color.

Source. If map separately published, name of institution issuing it, place and date given. If a supplement, title of paper or book, author, periodical, volume, pages and year given.

Comment. Descriptive and critical. In brackets.

Regional Classification. Major political divisions the unit, as a rule, except for United States and Canada. Boundaries of continents according to Siever's *Länderkunde*, Kleine Ausgabe.

MAPS ISSUED BY UNITED STATES GOVERNMENT BUREAUS

U. S. GEOLOGICAL SURVEY

Topographic Sheets

Alabama. Columbiana Quadrangle. 1:62,500 (1 in.=0.99 mile). 33°15′ - 33°0′ N.; 86°45′ - 86°30 W. Contour interval 50 ft. Surveyed in 1909. Edition of June 1911.

California. (a) Antelope Quad. 1:31,680 (1 in.=0.50 mile). 38°45′ - 38°37′30″ N.; 121°22′30″ - 121°15′ W. Interval 5 ft. Surveyed in 1908–09. Edit. of June 1911.

(b) Arcade Quad. 1:31,680. 38°45′ - 38°37′30″ N.; 121°30′ - 121°22′30″ W. Interval 5 ft. Surveyed in 1908–09. Edit. of May 1911.

(c) Brighton Quad. 1:31,680. 38°37′30″ - 38°30′ N.; 121°30′ - 121°22′30″ W. Interval 5 ft. Surveyed in 1908–09. Edit. of June 1911.

[Belong to the series of half-mile-to-an-inch maps of the Sacramento Valley. Map (c) includes the greater part of the city of Sacramento.]

Idaho. Meadows Quad. 1:125,000 (1 in.=1.97 miles). 45°0′ - 44°30′ N.; 116°30′ - 116°0′ W. Interval 100 ft. Surveyed in 1907–09. Edit. of May 1911.

Illinois. La Salle Quad. 1:62,500. 41°30′ - 41°15′ N.; 89°15′ - 89°0′ W. Interval 20 ft. Surveyed in 1909. Edit. of May 1911.

Maine. Ellsworth Quad. 1:62,500. 44°45′ - 44°30′ N.; 68°30′ - 68°15′ W. Interval 20 ft. Surveyed in 1907–09. Edit. of June 1911.

Maine-New Hampshire. Fryeburg Quad. 1:62,500. 44°15′ - 44°0′ N.; 71°0′ - 70°45′ N. Interval 20 feet. Surveyed in 1909. Edit. of June 1911.

Nevada-California. Hawthorne Quad. 1:250,000 (1 in.=3.95 miles). 39° - 38° N.; 119° - 118° W. Interval 100 feet. Surveyed in 1909. Edit. of May 1911.

New York. Antwerp Quad. 1:62,500. 44°15′ - 44°0′ N.; 75°45′ - 75°30′ W. Interval 20 ft. Surveyed in 1908–09. Edit. of June 1911.

Ohio. (a) Covington Quad. 1:62,500. 40°15′ - 40°0′ N.; 84°30′ - 84°15′ W. Interval 10 ft. Surveyed in 1909. Edit. of June 1911.

(b) Delphos Quad. 1:62,500. 41°0′ - 40°45′ N.; 84°30′ - 84°15′ W. Interval 10 ft. Surveyed in 1909. Edit. of June 1911.

(c) Uhrichsville Quad. 1:62,500. 40°30′ - 40°15′ N.; 81°30′ - 81°15′ W. Interval 20 ft. Surveyed in 1908–09. Edit. of July 1911.

[Metaled roads shown by a separate symbol, introduced on recent maps.]

Oregon. Crater Lake National Park. 1:62,500. 43°4′ - 42°48′ N.; 122°16′ - 122°0′ W. Surveyed in 1908–09. Edit. of June 1911.
[Soundings by M. B. Kerr in 1886, in blue. On reverse illustrations and descriptions of Crater Lake.]

Pennsylvania. Hamburg Quad. 1:62,500. 40°45′ - 40°30′ N.; 76°0′ - 75°45′ W. Interval 20 ft. Surveyed in 1908–09. Edit. of June 1911.

Wyoming-Montana. Sheridan Quad. 1:125,000. 45°0′ - 44°30′ N.; 107°0′ - 106°30′ W. Interval 100 ft. Surveyed in 1898 and 1909. Edit. of May 1911.

Maps Accompanying Publications

ALABAMA. Sketch map showing location of iron-ore and marble deposits southeast of Calera, Shelby County, Ala. [1:110,000 approx. (1 in. = 1.7 miles approx.)]. 33°5′ N. and 86°42′ W. Accompanies, as Fig. 1 on p. 4, "Variegated Marble Southeast of Calera, Shelby County, Alabama," by C. Butts in Advance Chapter from Contr. to Econ. Geol., 1910, Part I, *Bull.* 470–G, pp. 3–5, 1911.

ALASKA. (a) Map of the Copper and Chitina Valleys, showing Location of Area Represented on Nizina Special Map. [1 in.=20 miles (1:1,267,200)]. 62° - 60° N.; 146½° - 142° W.
(b) Topographic Map of the Nizina District, Alaska. Surveyed in 1908 by D. C. Witherspoon and R. M. La Follette. 1:62,500 (1 in.=0.99 mile). 61°37′ - 61°12′ N.; 143°0′ - 142°22′ W. Latitude and longitude approximate. 2 colors. Edition 1911. [Relief in brown contours; interval 50 ft.].
(c) Geologic Map of the Nizina District, Alaska. Geology by F. H. Moffit and S. R. Capps. Surveyed in 1909. Same scale and coordinates as map (b). With two sections. 9 colors. Edition 1911.
Accompany, as Plates I, II and III, "Geology and Mineral Resources of the Nizina District, Alaska," by F. H. Moffit and S. R. Capps, *Bull.* 448, 1911.

CALIFORNIA. Sketch Map of Trinity River Basin, Cal., Showing Areas of Auriferous Gravels of Second and Third Cycles of Erosion. [1 in =6 miles (1:380,160)]. [41°0′ - 40°15′ N.; 123°40′ - 122°40′ W.]. Accompanies, as Pl. I, facing p. 8, "The Auriferous Gravels of the Trinity River Basin, Cal.," by J. S. Diller, in Advance Chapter from Contr. to Econ. Geol., 1910, *Bull.* 470–B, pp. 3–21, 1911.

COLORADO. Map showing areas of gypsum in Eagle County, Colo. (From the General Land Office Map of Colorado, 1910.) [1 in.=12 miles (1:760,320)]. [39°55′ - 39°20′ N.; 107°5′ - 106°10′ W.]. Accompanies, as Fig. 9 on p. 124, "Gypsum Deposits in Eagle County, Colorado," by E. F. Burchard in Advance Chapter from Contr. to Econ. Geol., 1910, Part I, *Bull.* 470–G, pp. 120–131, 1911.

IDAHO. Geologic Map of the Upper St. Joe River Basin, Shoshone County, Idaho. By J. T. Pardee. 1:250,000 (1 in.=3.95 miles). 47°32′ - 46°50′ N.; 116°10′ - 115°5′ W. Accompanies, as Pl. II, facing p. 32, "Geology and Mineralization of the Upper St. Joe River Basin, Idaho," by same author in Advance Chapter from Contr. to Econ. Geol., 1910, *Bull.* 470–B, pp. 31–53, 1911.
[Valuable. Authentic maps of this region hitherto rare.]

KANSAS. Geologic Map of Kansas. Prepared under the direction of Erasmus Haworth, State Geologist, 1909. 1 in.=24 miles (1:1,520,640). 40° - 37° N.; 102°3′ - 94°37′ W. 15 colors. Accompanies, as Pl. I, facing p. 24, "Quality of the Water Supplies of Kansas" by H. N. Parker, *Water Supply Paper* 273. 1911.

MASSACHUSETTS. Map of Massachusetts Showing Quarrying Centers. 1:750,000 (1 in.=11.83 miles). 42°45′ - 41°35′ N.; 73°30′ - 70°30′ W. Accompanies, as Pl. I, facing p. 6, "Supplementary Notes on the Commercial Granites of Massachusetts," by T. N. Dale, in Advance Chapter from Contr. to Econ. Geol., 1910, Part I, *Bull.* 470–G, pp. 6–54, 1911.

MONTANA. Reconnaissance Geologic Map of the Elkhorn Mountains, Mont. 1:125,000 (1 in.= 1.97 mile). 46°30′ - 46°8′ N.; 112°3′ - 111°40′ W. With section and inset map showing general location. Accompanies, as Pl. II, facing p. 68, "Geologic Relation of Ore Deposits in the Elkhorn Mountains, Mont.," by R. W. Stone in Advance Chapter from Contr. to Econ. Geol., 1910, *Bull.* 470–B, pp. 67–90, 1911.

NEVADA. Sketch map of a portion of west-central Nevada. Adapted from the Reno, Wadsworth, Carson and Wabuska topographic sheets. [1:500,000 approx. (1 in.=7.9 miles approx.)]. [39°44′ - 39°18′ N.; 119°50′ - 119°10′ W.]. Accompanies, as Fig. 9 on p. 92, "Note on the Economic Geology of the Ramsey, ... Mining Districts, . . . Nevada," by J. M. Hill in Advance Chapter from Contr. to Econ. Geol., 1910, *Bull.* 470–B, pp. 91–100, 1911.
[Shows location of ore deposits.]

NEW MEXICO. Map showing geologic relations of fissure veins near Pinos Altos, N. Mex. [1:70,000 approx. (1 in.=1.1 miles approx.)]. [32°50′ N. and 108°13′ W.]. Accompanies, as Fig. 10 on p. 102, "The Ore Deposits near Pinos Altos, N. M.," by Sidney Paige in Advance Chapter from Contr. to Econ. Geol., 1910, *Bull.* 470–B, pp. 101–117, 1911.

PENNSYLVANIA. (a) Reconnaissance Map of the Oil and Gas Pools of the Foxburg Quadrangle, Pa., Showing Structure and Producing Areas of the Various Oil Sands. 1:62,500 (1 in.=0.99 mile). 41°15′ - 41°0′ N.; 79°45′ - 79°30′ W. 8 colors. [Shows boundaries of oil and gas pools, location of oil and gas wells and structure contours superimposed on Foxburg topographic sheet (surveyed in 1905–07; contour interval 20 ft.).]
(b) Geologic Map of the Foxburg Quadrangle, Pa., Showing Structure and Coal Outcrops. Geology by E. W. Shaw. Surveyed in 1908. Same scale and coordinates as map (a). 10 colors. [Geology superimposed on topographic sheet. Structure contours shown.]
(c) Sketch Map Showing Thickness, Extent and Structure of the Third or Gordon Sand in the Foxburg Quadrangle, Pa. [1:200,000 approx. (1 in.=3.1 miles approx.)]. Same coordinates as map (a). 1 color.
(d) Sketch Map of Western Pennsylvania and Parts of Ohio, West Virginia, Maryland and New York, showing oil and gas fields, location of quadrangles and nature of geologic reports published on each. [1 in.=25 miles (1:1,584,000)]. [42°20′ - 39°20′ N.; 81°10′ - 77°30′ W.] 3 colors.
(e) Map showing original extent of Vanport limestone members in Foxburg quadrangle. [1:200,000 approx.] Same coordinates as map (a).
Accompany, as Plates X, I (both in pocket), V (facing p. 16), IX (p. 66), and Fig. 3 (p. 30), "Coal, Oil and Gas of the Foxburg Quadrangle, Pa.," by E. W. Shaw and M. J. Munn, *Bull.* 454, 1911.

TEXAS. (a) [Geologic] Map of Central Coastal Plain Region of Texas, Showing Location of Clay Deposits. 1911. [1:1,500,000 approx. (1 in.=23.7 miles approx.)]. 31°20′ - 28°10′ N.; 99° - 95° W.
(b) Map of Clay and Lignite Fields near Lena, Fayette County, Tex. 1911. [1:46,000 approx. (1 in.=0.7 mile approx.)]. [29°53′ N. and 97° W.].
Accompany, as Pls. I and III, facing pp. 68 and 74, "Notes on Some Clays from Texas," by A. Deussen in Advance Chapter from Contr. to Econ. Geol., 1910, Part I, *Bull.* 470–G, pp. 68–117, 1911.

UTAH. [Nine maps accompanying "Ground Water in Juab, Millard and Iron Counties, Utah" by O. E. Meinzer, *Water Supply Paper* 277, 1911:]
(a) Map of Utah showing areas investigated [and described in *Water-Supply Papers*]. [1:4,600,000 approx. (1 in.=72.6 miles approx.)]. Fig. 1, on p. 10.
(b) Topographic Map of Juab and Millard Counties, Utah, Showing Areas of Flowing Wells. 1911. 1:1,000,000 (1 in.=15.78 miles). 40°0′ - 38°35′ N.; 114°3′- 111°35′ W. 3 colors. Pl. I, facing p. 10.
(c) Topographic Map of Iron County, Utah, Showing Areas of Flowing Wells. 1911. 1:1,000,000. 38°7′ - 37°30′ N.; 114°3′ - 112°35′ W. 3 colors. Pl. II, facing p. 16.
(d) Map of Juab, Millard, Beaver and Iron Counties, Utah, showing areas covered by Lake Bonneville. [1:2,300,000 approx. (1 in.=36.3 miles approx.)]. 40° - 37½° N.; 114° - 111½° W. Fig. 2, on p. 17.
(e) Map of Juab Valley, Utah, showing ground water conditions. [1:3,800,000 approx. (1 in.=60.0 miles approx.)]. [39°40′ N. and 111°50′ W.]. Fig. 9, on p. 68.
(f) [Geologic] Map of Tintic mining district, showing the relation of the water supply to the igneous rocks. [1:94,000 approx. (1 in.=1.5 mile approx.)] 39°55′ N. and 112°5′ W. Fig. 10, on p. 83.
(g) Map of Pavant Valley, showing streams, springs and ground-water conditions. [1:357,000 approx. (1 in.=5.6 miles approx.)] [39°16′ - 38°42′ N.; 112°35′ - 112°7′ W.] Fig. 11, on p. 87.
(h) Map of a part of the south basin of Rush Lake Valley. [1:190,000 approx. (1 in.=1.4 miles approx.)] 37°38′ N. and 113°13′ W. Fig. 13, on p. 146.
(i) Topographic Map of Fish Springs Quadrangle, Utah. Surveyed in 1908. 1:250,000 (1 in.=3.95 miles). 40° - 39° N.; 114° - 113° W. 2 colors. 1911. Pl. IV (in pocket).
[On Pls. I and II contours in brown, interval 1,000 ft.; areas of flowing wells in green. Pl. IV standard topographic sheet: contour interval 100 ft. On Fig. 11, contour interval 500 ft.]

U. S. COAST AND GEODETIC SURVEY

Atlantic Coast

Penobscot Bay, Maine. 1:80,000 (1 in.=1.26 miles). Oriented N. 20° E. 44°30′ - 43°45′ N.; 69°10 - 68°25′ W. Chart No. 104. Aug. 1911. 50 cts.
East Penobscot Bay, Maine. 1:40,000 (1 in.=0.63 mile). 44°20.8′ - 43°59.4′ N.; 68°50.2′ - 68°31.6′ W. Chart No. 309. Aug. 1911. 25 cts.
Harbors of Plymouth, Kingston and Duxbury, Massachusetts. 1:40,000. 42°5′ - 41°55′ N.; 70°46′ - 70°31′ W. Chart No. 338. July 1911. 25 cts.
Provincetown Harbor, Massachusetts. 1:50,000 (1 in.=0.79 mile). 42°6′ - 41°56′ N.; 70°19′ - 70°3′ W. Chart No. 341. Aug. 1911. 20 cts.
Fishers Island Sound, Connecticut. 1:20,000. (1 in.=0.32 mile). 41°22′ - 41°14.6′ N.; 72°3 8′ - 71°49.4′ W. Chart No. 358. Aug. 1911. 40 cts.
Connecticut River: Entrance to Deep River. 1:20,000. Oriented N. 33° E. 41°24′ - 41°13′ N.; 72°25′ - 72°15′ W. Chart No. 253. July 1911. 25 cts.
Hampton Roads, Virginia. 1:20,000. 37°1.5′ - 36°52.5′ N.; 76°27′ - 76°13.5′ W. With inset forming continuation of S.E. corner of map: 36°52.5′ - 36°49′ N.; 76°21′ - 76°16.5′ W. Chart No. 400. July 1911. 50 cts.
Pamlico Sound, North Carolina. Eastern Sheet. 1:80,000. Oriented N. 18° E. 35°53′ - 35°5′ N.; 76°3′ - 75°20′ W. Chart No. 142. Aug. 1911. 50 cts.

Pacific Coast

Pacific Coast from San Diego to Santa Monica including the Gulf of Santa Catalina, California. 1:200,000 (1 in.=3.16 miles). Oriented N. 28° W. 34°3′ - 32°20′ N.; 119° - 117° W. Chart No. 5100. June 1911. 50 cts.
Pacific Coast from San Francisco to Point Arena, California. 1:200,000. Oriented N. 26° E. 39°10′ - 37°20′ N.; 124°30′ - 122°10′ W. Chart No. 5600. July 1911. 50 cts.
Seacoast and Interior Waters of Washington from Grays Harbor to Semiamoo Bay. 1:300,000. (1 in.=4.73 miles). 49°20′ - 46°46′ N.; 125°18′ - 122°8′ W. 1 color (land surface). Chart No. 6400. July 1911. 50 cts.
Wrangell Strait, Alaska. 1:20,000. 56°50.3′ - 56°30′ N.; 133°1′ - 132°53.7′ W. In two parts. 1 color. Chart No. 8170. July 1911. 50 cts.

Pacific Ocean—Philippine Islands

Mangarin and Pandarochan Bays, Southwest Coast of Mindoro. 1:40,000. 12°22′ - 12°8′ N.; 120°58.5′ - 121°15′ E. 1 color. Chart No. 4340. Aug. 1911. 30 cts.
Northeastern Panay and Adjacent Islands. 1:100,000. (1 in.=1.58 mile). 11°51′ - 10°54′ N.; 122°54′ - 123°35′ E. 1 color. Chart No. 4417. Aug. 1911. 40 cts.
(a) Guiuan Harbor, South Coast of Samar. 1:20,000. 11°1.7′ - 10°59.2′ N.; 125°39.1′ - 125°44.1′ N. 1 color. (b) Pambujan Harbor, East Coast of Samar. 1:35,000 (1 in.=0.55 mile). 11°18.5′ - 11°10.6′ N.; 125°31′ - 125°40′ E. 1 color. Chart No. 4467. Aug. 1911. 30 cts.

LAKE SURVEY OFFICE

MICHIGAN–ONTARIO. Lower Detroit River showing Available Channel and Positions of Aids to Navigation. Prepared under the direction of Lieut. Col. C. S. Riché, Corps of Engineers, U. S. Army, in 1911. 1:25,000 (1 in.=0.39 miles). 42°9′ - 41°57.5′ N.; 83°9.6′; 83°5.7′ W. 2 colors. Accompanies *Suppl.* No. 3, 1911, to *Bull.* No. 20, Survey of Northern and Northwestern Lakes, 1911.

[WAR DEPARTMENT]

ALASKA. Map of Alaska. By the Alaska Road Commission. 1909. Information compiled from the Surveys of the Alaska Road Commission, the U. S. Coast and Geodetic Survey, the U. S. Geological Survey, U. S. Army Surveys and the Canadian Geological Survey. 1:1,250,000, or 1 in.=19.73 miles. 71½°- 54½° N.; 172°- 138° W. With two insets: (1) Aleutian Islands, 1:2,500,000 or 1 in.=39.46 miles; (2) Pribilof Islands, 1:5,000,000 (1 in.=28.91 miles). 4 colors. In four sheets.
[Valuable because of its large scale which is twice that of the standard map of Alaska accom-

panying Brooks's monograph (U. S. G. S. *Prof. Pap.* 45). Relief in brown contours; interval approximately 1,000 ft. Shows wagon roads, sled roads, pack trails, railroads, telegraph and telephone lines].

NORTH AMERICA

United States

California. Map of California Showing the Approximate Location of the Principal Mineral Deposits. Compiled by the State Mining Bureau, San Francisco, Cal. Dec. 1910. [1:765,000 approx. (1 in.=12.1 miles approx.)] 2 colors. In two sheets.

[48 different mineral deposits indicated].

New York–Ontario. [Map of Niagara Falls]. [1:30,000 approx. (1 in.=0.47 mile)]. Accompanies, on p. 426, "St. Lawrence River and Niagara Falls" by F. Kobayashi, *Journ. of Geogr.* (Tokyo), Vol. 23, pp. 421–428, 1911.

[Article and nomenclature of map in Japanese].

Mexico. [Three meteorologic maps of Mexico for Jan. 1911 entitled:] (1) Distribución de la Temperatura en la República Mexicana. Media Mensual. (2) Frecuencia de la lluvia en la República Mexicana. (3) Precipitación total en la República Mexicana. 1:12,000,000 (1 in.=18.94 miles). 32½° - 14° N.; 117° - 86° W. 1 color. Accompany, as Lam. 1–3, *Bol. Mens. del Observ. Meteorol. Magn. Centr. de Mexico*, Jan. 1911.

[Map (1) shows six degrees of differentiation for temperature, map (2) four degrees for rain and map (3) three degrees for total precipitation. These maps are published monthly as supplements to the *Boletín*].

SOUTH AMERICA

Brazil. Brazil segundo os mais Recentes Trabalhos por R. Hausermann. 1907. 1:10,000,000 (1 in.=157.83 miles). 6° N. - 35° S.; 74° - 33° W. 4 colors. Accompanies "Brazil: Its Natural Riches and Industries," Vol. 1, Comm. d'Expans. Econ. do Brazil. Paris, 1910.

[Good general map. Relief in brown shading; drainage in blue; railroads in black; boundaries in green].

Venezuela. (a) Croquis Demostrativo del Estado de los Trabajos del Mapa Fisico y Politico de Venezuela. 1:5,000,000 (1 in.=78.91 miles). 12½° - 1° N.; 73° - 60° E. 1 color. [Shows stations determined astronomically and area covered by triangulation and topographic survey].

(b) Estado actual de la Triangulación. Mapa Fisico y Politico de Venezuela. 31 de Diciembre de 1910. 1:500,000 (1 in.=7.89 miles). [Triangulation net].

(c) Plano para el Estudio de la Desviación de la Plomada en La Guaira. 1:50,000 (1 in.=0.79 mile). [Lines of equal deviation of the plumb-line].

Accompany, in pocket, "Trabajos del Cuerpo de Ingenieros encargado del levantamiento del Mapa Fisico y Politico de Venezuela," Caracas, 1911.

Venezuela. (a) Exploración del Camino del "Alto Cocoyar" á Maturín. 1:375,000 (1 in.=5.92 miles).

(b) Exploración de los Caminos que unen á Maturín con Puerto San Juan. 1:125,000 (1 in.=1.97 miles).

(c) Exploración del Rio Guarapiche entre Maturín y Caño-Colorado. 1:40,000 (1 in.=0.63 miles).

(d) Camino de Maturín á Caño Colorado. 1:100,000 (1 in.=1.58 miles).

Accompany, facing pp. 266, 268 and 270, "Informe de la Comisión sobre el camino de Cumanacoa á Maturín etc." by M. C. Pérez, *Rev. Tecn. del Minist. de Obras Publ.*, Vol. 1, pp. 265–272, Caracas, 1911.

[Route surveys starting from Maturín (9°40′ N. and 63° W.)].

Venezuela. Centros Pecuarios del Estado Monagas. [No scale. 1:1,200,000 approx. (1 in.=20.5 miles approx.)]. [10°20′ - 8°10′ N.; 64°0′ - 62°5′ W.]. 1 color. Accompanies, facing p. 276, "Suplemento al Informe sobre estudio comparativo de las vias del Estado Monagas," *Rev. Tecn. del Minist. de Obras Publ.*, Vol. 1, pp. 275–278, Caracas, 1911.

[Shows cattle markets.]

AFRICA

British East Africa. Sketch of the country between the Juba River and Lake Rudolf to illustrate the paper by Lieut. L. Aylmer. 1:500,000, or 1 in.=78.91 miles. 5° N. - ¼° S.; 35½° - 44° E. Accompanies, on p. 291, paper with similar title by same author, *Geogr. Journ.*, Vol. 38, pp. 289–296, 1911.

Egypt. (a) [Fifteen maps showing location of wells, entitled:] Plan Showing Wells at: Edfu (Plate V); Esna (Pl. VI); Karnak (Pl. VII); Qift (Pl. IX); Qena (Pl. X); Dishna (Pl. XI); Naga Hamadi (Pl. XII); Girga (Pl. XIII); Sohag (Pl. XIV); Tahta (Pl. XVI); Assiut (Pl. XVII); Minia (Pl. XVIII); Beni Suef (Pl. XIX); Wasta (Pl. XX); Giza (Pl. XXI). 1:50,000 (1 in.=0.79 miles). 2 colors.

(b) Map of Upper Egypt Showing Position of Localities from which Data Were Collected. 1907–08. 1:4,000,000 (1 in.=63.13 miles). 32° - 24° N.; 28° - 35° E. (Pl. IV).

Accompany, as indicated above, "The Movements of the Subsoil Water in Upper Egypt" by H. T. Ferrar, *Surv. Dept. Paper* No. 19, Survey Dept. of Egypt, 1911.

[Plates V–XXI are extracts from the topographic map, 1:50,000. Wells indicated by red circles. Pl. IV shows location of places represented in detail on Pls. V–XXI.]

Mauritania. (French West Africa.) (a) Région des Salines du Trarza Occidental. [1:5,300,000 approx. (1 in.=83.6 miles approx.).] [17° N. and 16° W.]

(b) Région des puits d'Agamoun et des Salines de N'Térert et Touidermi. [1:110,000 approx. (1 in.=1.7 mile approx.).] [Region at N. end of map (a).]

Accompany, on pp. 162 and 163, "Les Salines du Trarza" by G. Mère, *Renseign. Colon.*, No. 7, pp. 161–167, 1911.

Mauritius. Carte de l'Ile Maurice. [1:750,000 approx. (1 in.=11.8 miles approx.).] [20¼° S. and 57½° E.] Accompanies, on p. 239, "L'Angleterre en Afrique" by E. de Renty, Paris, [1911?].

[Shows roads and railroads of both narrow and standard gauge.]

MOROCCO. Deutsche Ansprüche an Marokko. 1:4,000,000 (1 in.=63.16 miles). 36° - 27⅓° N.; 13° W. - 0°. 6 colors. Accompanies, as Taf. 11, *Deutsche Erde*, Vol. 10, 1911.

NORTHERN NIGERIA. Northern Nigeria: Divisions administratives. [1:7,450,000 approx. (1 in.= 117.6 miles approx.).] 14° - 6° N.; 30° - 15° E. Accompanies, facing p. 188, "L'Angleterre en Afrique" by E. de Renty, Paris, [1911?]. Reproduced from *Quest. Dipl. et Colon.*

[Outline map showing boundaries of provinces.]

SAHARA. Reconnaissance des Compagnies Sahariennes du Touat et de la Saoura dans les Ergs Atimine, Iguidi et la Basse Daoura: nov. 1909-janv. 1910. In three sections. [1:1,600,000 approx. (1 in.=25.2 miles approx.).] 29°40′ - 27°0′ N.; 5°50′ - 1°50′ W. With "Carte d'Ensemble" [1:2,900,000 approx. (1 in=45.8 miles approx.)] showing relationship of sections and index map showing general location. Accompanies, on p. 169, "Dans les Ergs El-Atimine et Iguidi" by Capt. Cancel, *Renseign. Colon.*, No. 7, pp. 167-178, 1911.

SIERRA LEONE. Sierra Leone. [1:2,800,000 approx. (1 in.=44.2 miles approx.).] [11½° - 6° N.; 13½° - 10½° W.] Accompanies, facing p. 219, "L'Angleterre en Afrique" by E. de Renty, Paris, [1911?]. Reproduced from *Quest. Dipl. et Colon.*

[Shows boundaries of districts.]

SOCOTRA. [Geologische Karte von] Sokótra. 1:250,000 (1 in.=3.95 miles). 12½° N and 54° E. 8 colors. Accompanies, as Taf. 1, "Geologie der Inseln Sokótra, Sémha und Abd El Kûri" by F. Kossmat, *Denkschr. k. Akad. Wiss.*, Math.-Naturw. Klasse, Vol. 71, Part 1, pp. 1-62, Vienna, 1907.

[Valuable original map on large scale. Embodies results of Austrian Expedition to Southern Arabia, 1898-99.]

SUDAN. Sketch of a route across Lake Chad by P. A. Talbot, B.A., Feb. 1911. 1:500,000, or 1 inch=7.89 miles. 13°29′ - 12°57′ N.; 13°46′ - 14°40′ E. Accompanies, on p. 271, "Lake Chad" by P. A Talbot, *Geogr. Journ.*, Vol. 38, pp. 269-278, 1911.

[Soundings given.]

SUDAN. [Three maps entitled:] Der Tschadsee in Gegenwart und Vergangenheit. [By A. Bencke]. 1:4,000,000 (1 in.=63.13 miles). 1 color. (1) Denhams Karte, 1822-1824. 15½° - 11° N.; 13° - 17½° E. (2) Nachtigals Karte, 1871-1872. 15° - 11° N.; 12⅔° - 17° E. (3) Karte des Kapitäns Tilho, 1907. 15° - 11° N.; 13° - 16⅔° E. Accompany, as separate plate, note on "Die Entwickelung des Tschadsees," *Deutsche Rundsch. für Geogr.*, Vol. 33, p. 541, 1911.

ASIA

BORNEO. Geologisch Overzichtskaarte van de landen om de Balik-Papan-Baai. 1:250,000 (1 in= 3.95 miles). [1°5′ S. and 116°55′ E.] 4 colors. With three sections. Accompanies, as Kaart No. X, paper on "De Omgeving der Balikpapan-Baai" by L. Rutten and C. J. Rutten-Pekelharing, *Tijd. Kon. Nederl. Aardr. Genoot.*, Vol. 28, pp. 579-601, 1911.

CEYLON. [Map of] Ceylon. [1:1,500,000 approx. (1 in.=39.5 miles).] Accompanies, on p. 443, "Nach den Kautschuklanden" by A. H. Berkhout, *Der Tropenpfl.*, Vol. 15, pp. 436-446, 1911.

[Shows railroads and automobile roads.]

CHINA. (a) Map of the Western Yenchi District. 1:400,000 (1 in.=6.33 miles). [44° - 42° N.; 127⅔° - 130½° E.] 2 colors. With inset map of Manchuria and N. Korea showing general location. [Diagrammatic map showing chief towns and roads. Nomenclature in English and Chinese.]

(b) Sketch Map of China and Manchuria to illustrate railways in North China and trade routes converging upon Tientsin. [1:9,000,000 approx. (1 in. =142.4 miles approx.).] [54° - 29° N.; 92° - 134° E.] 2 colors. [Shows diagrammatically railroads completed, under construction, projected.]

Accompany: map (a), facing p. 46, Lungchingstun Trade Report, map (b), facing p. 138, Tientsin Trade Report, in Returns of Trade and Trade Reports, 1910, *Imp. Mar. Customs*, Part II. Vol. I, pp. 46-55 and 135-177, respectively, 1911.

CHINA. Map Showing the Distribution of Iron Ore in China. [1:7,000,000 approx. (1 in.=110.5 miles approx.).] 45° - 18° N.; 99° - 124° E. 1 color. Accompanies paper with similar title by K. Inouye, *Journ. of Geogr.* (Tokyo), Vol. 23, pp. 299-311, 1911.

[Paper and nomenclature of map in Japanese.]

FRENCH INDO-CHINA. Indo-Chine Française. 1:9,000,000 (1 in.=142.43 miles). 23½° - 8½° N.; 100° - 110° E. Accompanies "Le Laos" by L. de Reinach, Paris, [1911].

JAPAN. Map of the Usu Volcano Showing the arrangement of the Different Craters. [1:18,000 approx. (1 in.=0.28 mile).] [42°32′ N. and 140°50′ E.] 1 color. Accompanies, as Pl. IV, "Preliminary Report on the Eruption of Usu Volcano, 1910" by F. Omori, *Journ. of Geogr.* (Tokyo), Vol. 23, pp. 1-20, 1911.

[Paper and nomenclature of map in Japanese. Same map with English nomenclature listed in *Bull.*, Vol. 43, p. 797, 1911.]

JAPAN. Geological Map Showing the Distribution of Stream-Tin in the Environs of the Town of Naegi, Province Mino. [No scale]. [Probably 35°35′ N. and 137°25′ W.] 3 colors. Accompanies, as Pl. VI, paper with similar title by S. Noda, *Journ. of Geogr.* (Tokyo), Vol. 23, pp. 26-36, 1911.

[Paper and nomenclature of map in Japanese.]

JAPAN. [Map of Esan Volcano]. [1:50,000? (1 in.=0.79 mile).] [41⅗° N. and 141° E.] Accompanies, on p. 400, paper on "Esan Volcano and Esan Sulphur Mine," by J. Ohikata, *Journ. of Geogr.* (Tokyo), Vol. 23, pp. 399-406, 1911.

[Article and nomenclature of map in Japanese.]

KOREA. Map Showing the Distribution of Iron Ore in Korea. [1:2,000,000 (1 in.=31 56 miles)]. 1 color. Accompanies, as Pl. X, paper with similar title by K. Inouye, *Journ. of Geogr.* (Tokyo), Vol. 23, pp. 97-109, 1911.

[Paper and nomenclature of map in Japanese.]

MANCHURIA. Map Showing the Distribution of Iron Ore in Manchuria. [1:2,200,000 approx. (1 in.=34.7 miles approx.)]. [43° - 38⅔° N.; 121° - 127° E.]. 1 color. Accompanies, as Pl. XII, "The Iron Ore of Southern Manchuria," by K. Inouye, *Journ. of Geogr.* (Tokyo), Vol. 23, pp. 164-176 1911.

AUSTRALIA AND OCEANIA

DUTCH NEW GUINEA. Part of Dutch New Guinea to illustrate the explorations of Captain C. G. Rawling . . . and Mr. E. Marshall . . . of the British Expedition, 1909–11. 1:250,000, or 1 in.=3.94 miles. 4°0′ - 4°55′ S.; 136°18′ - 137°15′ E. With inset map of western New Guinea, 1:10,000,000, showing location of main map. 3 colors. Accompanies, as separate plate, "Explorations in Dutch New Guinea," by C. G. Rawling, *Geogr. Journ.*, Vol. 38, pp. 233–255, 1911.

[Embodies results of explorations of axial range of New Guinea west of those made by Lorentz.]

EUROPE

AUSTRIA. Plateau des Zahmen-Kaisers. 1:25,000 (1 in.=208.3 ft.). [47°35′ N. and 12°17′ E.] 4 colors. With inset "Übersichtsplan der Messbandzüge. 1:75,000" and separate plate on tracing paper superimposed on the main map, showing geometric coordinates, etc. Accompany, as Taf. 4a and 4b, "Das Plateau des Zahmen-Kaisers," by L. Distel and F. Scheck, *Mitt. Geogr. Gesell. München*, Vol. 6, pp. 97–166, 1911.

[Detailed survey of a massif of the Tyrolean Alps near the Bavarian frontier.]

AUSTRIA. Übersichtskärtchen der nordsteirischen Alpen im Gebiete der Mürz, Mur und Liesing. Nach den geologischen Aufnahmen von M. Vacek und A. Bittner. [1:230,000 approx. (1 in.=3.6 miles approx.)]. [47°35′ - 47°15 N.; 14°45′ - 15°30′ E.]. Accompanies, on pp. 158–159, "Die Trofaiachlinie . . ." by H. Vetters, *Verhandl. der k.k. geol. Reichsanst.*, No. 7, pp. 151–172, 1911.

FRANCE. Limite de la Montagne dans le Limousin. 1:320,000. (1 in.=5.05 miles). 45°55′ - 45°22′ N.; 1°42′ - 3°36′ E. Accompanies, as Fig. 1, on pp. 318–319, "La Montagne dans le Limousin: Étude de Géographie Humaine," by A. Demangeon, *Ann. de Géogr.*, Vol. 20, pp. 316–337, 1911.

[Boundary of natural region with the above name traced on an extract from sheet 22 (Clermont) of the Carte de France, 1:320,000.]

FRANCE. Carte Aéronautique: Feuille Châlons. Service Géographique de l'Armée. 1:200,000 (1 in.=3.16 miles). 48°47′ - 49°27′ N.; 3°41′ - 5°23′ E. 4 colors. Accompanies, as Pl. XVIII, "La Carte Aéronautique du Service Géographique de l'Armée" by Commandant P. Pollacchi, *Ann. de Géogr.*, Vol. 20, pp. 311–315, 1911.

[A map admirably adapted to the purpose it is intended to serve. It marks a decided advance in aeronautic cartography. It brings out prominently the features of greatest importance to the aeronaut. Relief, although represented, is therefore wisely relegated to second place: the ground plan is made easily legible. Roads stand out in white on a buff back-ground, towns and houses are shown in red, forests in green. Dangerous landing places are specially designated. Prominent points such as belfries, churches, windmills, factory chimneys, isolated trees, have their own symbols. Parking spaces, dirigible and aeroplane sheds are shown. The sheets Paris, Amiens, Mézières are in preparation

GERMANY. (a) Koblenz um 1900. 1:30,000 (1 in.=0.47 miles).

(b) [Extract from Ravenstein's Map of Germany, 1:300,000 (1 in.=4.73 miles).] 51°5′ - 49°37′ N.; 6°45′ - 9°17′ E. 3 colors.

Accompany, as Fig. 1 on p. 17 and as a separate plate, "Kulturgeographische Wanderungen im Koblenzer Verkehrsgebiet" by R. Martiny, *Forsch. zur deutsch. Landes- und Volkskunde*, Vol. 19, No. 3, 1911.

[Map (a) suggestive in its thoroughly geographic treatment of built-up areas. Distinguishes between houses in the old nucleus of the town, apartment houses and private residences in the newer part, and farm-houses on the outskirts.]

GERMANY. Geologische Übersichtskarte Nordwestdeutschlands [1:2,300,000 approx. (1 in.=36.3 miles approx).] [55° - 51½° N.; 4½° - 12° E.]. Accompanies, on pp. 104–105, "Der Geologische Aufbau und die Oberflächengestaltung Nordwestdeutschlands" by K. Olbricht, 12. *Jahresb. Geogr. Gesell. Hannover*, pp. 87–113, 1911.

[Sketch map in form not fit for publication].

GERMANY. (a) Nordwestdeutschland, Körper-Geographie. Beispiel: Verbreitung der Färbung. (b) Nordwestdeutschland, Sprach-Geographie. Beispiel: Verbreitung der Hauptmundarten nach Lautstand und Tonfall. (c) Nordwestdeutschland, Sach-Geographie. Beispiel: Verbreitung der Haustypen. Nach den Forschungen von Dr. Willi Pessler. [Maps (a), (b) and (c): (1:4,800,000 approx. [1 in.=75.8 miles approx.])]. 55° - 50½° N.; 2° - 13° E.

(d) Das altsächsische Bauernhaus in Umkreise der Stadt Hannover. Nach den Forschungen von Dr. Willi Pessler. [1:190,000 approx. (1 in.=3.0 miles approx.) Scale incorrectly given]. 52°30′ - 53°11′ N.; 9°20′ - 10°0′ E.

(e) Die Abweichung der altsächsischen Hausgrenze von der niederdeutschen und niedersächsischen Sprachgrenze. [1:3,475,000 approx. (1 in.=54.8 miles approx.). Scale incorrectly given]. 55° - 50⅔° N.; 3⅓° - 17½° E.

(f) Nordwestdeutschland. Versuch einer Karte der verschiedenen Arten des Fensteröffnens. [1:2,750,000 approx. (1 in. 43.4 miles approx.) Scale incorrectly given]. 54⅔° - 51° N.; 3⅓° - 12⅔° E.

Accompany, as Karten 1, 2, 4 and 3, on pp. 3, 5, 11, 8–9, and facing pp. 65 and 81, "Beiträge zur vergleichenden Volkskunde Niedersachsens" by W. Pessler, 12. *Jahresb. Geogr. Gesell. Hannover*, pp. 1–86, 1911.

[Maps (a), (b) and (c) show distribution of somatic types, dialects and architectural forms. Map (f) shows distribution of various types of windows. Suggestive with regard to the geographic treatment of such topics.]

GERMANY. [Four maps entitled:] Die Muttersprache der Bevölkerung in den einzelnen Kreisen der Provinz Schleswig-Holstein am 1. Dezember 1905. [1:2,750,000 approx. (1 in.=43.4 miles approx.)]. 55°50′ - 53°0′; 6°-1 3° E. 6 colors. (a) Deutsche Muttersprache; (b) Dänische Muttersprache; (c) Andere fremde Muttersprache; (d) Deutsch und eine fremde Sprache. Accompany, as Taf. I, "Die Preussischen Dänen" by M. Broesike, *Ztschrft. des Königl. Preuss. Statist. Landesamts*, Vol. 51, pp. 73–90, 1911.

HUNGARY. Das Verbreitungsgebiet der deutschen Sprache im Südungarn. Auf Grundlage der Volkszählung vom 31. Dezember 1900. Blatt I: Gespanschaft Tolnau. Entworfen von Dr. Richard v. Pfaundler. [1:200,000 approx. (1 in.=3.1 miles approx.).] 46°49′ - 46°7′ N.; 17°44′ - 19°2′ W. 32 colors. Accompanies, as Taf. 6, "Das Deutsche Sprachgebeit im Südungarn," by same author, *Deutsche Erde*, pp. 68–76, 1911.

HUNGARY. (a) Tektonische Skizze des Zjargebirges und der angrenzenden Gebiete. 1:200,000 (1 in.=3.16 miles). [48°50′ N. and 18°40′ E.].

(b) Geologische Karte des Zjargebirges und der angrenzenden Gebiete. 1:75,000 (1 in.=1.18 miles). 25 colors.

(c) Geologische Karte des Zjargebirges: Das Gebiet der stärksten Faltung. 1:25,000 (1 in.=0.39 miles). 19 colors.

Accompany, as Fig. 4, on p. 59, and Karten I and II, facing p 60, "Beiträge zur Geologie des Zjargebirges und des angrenzenden Teiles der Mala Magura in Oberungarn," by H. Vetters, *Denkschr. k. Akad. Wiss.*, Math.-Naturw. Klasse, Vol. 85, pp. 1–60, Vienna, 1910.

SCOTLAND. Density of Population of Scotland. 1911 Census. [1:1,300,000 approx. (1 in.=20.5 miles approx.).] 59° - 54 3/5° N.; 7⅗° - 2° W. With inset map of Orkney and Shetland Islands. [1:2,500,000 approx. (1 in.=39.5 miles approx.).] 9 colors. Accompanies "Density of Population, Scotland, 1911," by G. G. Chisholm, *Scott. Geogr. Mag.*, Vol. 27 pp. 466–469, 1911.

[Nine degrees of density indicated. Standard map prepared by the Edinburgh Geographical Institute.]

POLAR

ANTARCTIC REGIONS. Sketch Map of the Northern Peninsula of West Antarctica. 1:7,500,000, or 1 inch=118.37 miles. 63° - 70° S.; 75° - 52° W. Accompanies, on p. 288, "Antarctic Nature, Illustrated by a Description of North-West Antarctica," by O. Nordenskjöld, *Geogr. Journ.*, Vol. 38, pp. 278–289, 1911.

[Valuable: suggests more rational nomenclature.]

WORLD AND LARGER PARTS THEREOF

NORTHERN EURASIA. [Seven maps entitled:] (1) Von einem kalten Gebiete in Russland und Nordasien breiten sich in der Zeit vom 19. bis 26. Februar 1899 verschiedene Kältewellen aus. (2) Kältewelle vom 2. bis 14. November 1902. (3) Von einem kalten Gebiete breitet sich eine Kältewelle aus (12. bis 21. November 1902). (4) Ausbreitung einer Kältewelle in der Zeit vom 11. bis 21. Jänner 1902. (5) Ausbreitung einer Kältewelle in der Zeit vom 20. Mai bis 2. Juni 1899. (6) Wanderung eines barometrischen Steiggebietes in der Zeit vom 20. Mai bis 2. Juni. 1899. (7) Kältewelle in der Zeit vom 24. bis 31. Oktober 1901. [1:55,000,000 approx. (1 in.=858.0 miles approx.).] 83° - 35° N.; 10° - 180° E. Accompany, as Karten I–VII, "Die Ausbreitung kalter Luft in Russland und Nordasien (Fortschreiten der 'Kältewellen' in Asien-Europa)" by H. v. Ficker, *Sitzungsber. d. kais. Akad. d. Wiss.*, Math.-Naturw. Klasse, Vol. 119, Abt. IIa, pp. 1769–1837, Vienna, 1910.

WORLD. [Map of the World Showing] Azimuth and Distance from Tokyo. Mercator projection [equatorial scale 1:100,000,000]. 2 colors. Accompanies, as Pl. XV, paper with similar title by S. Nakamura, *Journ. of Geogr.* (Tokyo), Vol. 23, pp. 327–329, 1911.

[It is regrettable that so many seismologists have followed the example set by Prof. G. Grablowitz in his maps published in *Die Erdbebenwarte* of Laibach, Austria, showing azimuths and distances from given stations to aid in the determination of the seat of earthquakes whose tremors have been recorded on the seismograph. The use of the Mercator projection is here, too, extremely inappropriate. It involves tedious calculation to determine the points of intersection of the azimuths and the circles of distances. The curves resulting from joining these points are far from simple.

The fact that azimuths are to be shown should have pointed the way to the choice of the right projection, which must, of course, belong to the group of azimuthal projections, the basis of which is a network of concentric circles and radii diverging from their common center. The stereographic projection, with the earthquake station as its pole, will be found to be the best. On it the azimuths and circles of distances constitute the fundamental network of radii and concentric circles of the projection. It represents a graphic solution of the problem far easier than the calculations of the other method, entirely apart from the inappropriateness of the Mercator projection.]

OCEANOGRAPHICAL

NORTH ATLANTIC OCEAN. (a) Courbes de température dans l'Atlantique Nord pendant la période 29 juillet–9 août 1910, d'après les observations du "*François Arago*." (b) Courbes de température moyenne pendant le mois d'août d'après la *Deutsche Seewarte*. Both maps: Mercator projection [equatorial scale 1:55,000,000 approx.] 62° - 42° N.; 61° - 19° W. Accompany, as Figs. 3 and 4, on p. 309, "Observations Météorologiques du '*François Arago*' au large de Terre-Neuve" by H. Baulig, *Ann. de Géogr.*, Vol. 20, pp. 305–310, 1911.

HISTORICAL

TIBET. (a) Fac-similé de la *Figure III* de la *Carte générale du cours du Gange et du Gagra* . . . publiée par Anquetil-Duperron, en 1784. [5 "milles indiens"=0.84 in.] [30°40′ N.; 81°20′ E.]

(b) Fac-similé de la *Figure VI* de la *Carte générale* . . . d'Anquetil-Duperron (Fausse Source du Gange).

Accompany, as Figs. 1 and 2, on pp. 345 and 349, "Une Ancienne Carte des Sources du Gange" by C.-E. Bonin, *Ann. de Géogr.*, Vol. 20, pp. 338–350, 1911.

DUTCH GUIANA. Kaartje van de Corantijn (helft der oorspronkeligke grootte). [1:2,500,000 approx.] Oriented S. Accompanies, on p. 652, paper on "Twee Reizen van Paramaribo, een naar de Pariima in 1718 en een naar de Boven-Corantijn in 1720" by J.W. Ijzerman, *Tijd. Kon. Nederl. Aardr. Genoot.*, Vol. 28, pp. 648–661, 1911.

[Facsimile reduction to half-size of map of Corantijn R., dated 1720.]

EDUCATIONAL

EUROPE. Bathy-Orographical [School Wall] Map of Europe. 1:5,100,000, or 80 [80.49] miles to one inch. 75° - 33° N.; 40° W.—75° E. 13 colors. In two sheets, unmounted. W. & A. K. Johnston, Edinburgh, 9/—.

[A very good physical wall map. Relief is shown on land by eight tints, beginning in green and ending in brown, and, on sea, by five tints of blue. Although the color scheme is pleasing the absence of hachuring precludes the plastic effect of relief seen on the best German wall maps. The nomenclature (provided the use of names on a wall map be deemed justifiable) is critically chosen. This map is one of a series including the continents and oceans.]

ATLASES

HAMMOND'S POCKET ATLAS OF THE WORLD. C. S. Hammond & Co., New York, 1911. 263 pp., 19 plates and statistical tables. 6 x 4.

Contains separate maps of each state and of the Canadian provinces. In content and execution of the usual type of maps produced by the wax-engraving process. The inclusion of a map of the world on Mollweide's projection (referred to as the *only* equivalent projection) and others of world phenomena on Gall's projection testify to incipient, even if casual, contact with geographic thought. But the poor quality of the maps contrasts unfavorably with the up-to-date census statistics and the convenient form and good binding of the atlas.

OTHER ACCESSIONS

OCTOBER, 1911

AMERICA

(The size of books is given in inches to the nearest half inch.)

BASSLER, RAY S. The Cement Resources of Virginia West of the Blue Ridge. (Map and Ills.) Bulletin No. II–A. Virginia Geological Survey. Charlottesville, University of Virginia, 1909. 10 x 7. *Gift.*

CRIDER, ALBERT F. Cement and Portland Cement Materials of Mississippi. (Map, diagrams and ills.) Bulletin No. 1, Mississippi Geological Survey. Nashville, Brandon Printing Co. 1907. 9½ x 6. *Gift.*

FITCH, MICHAEL HENDRICK. The Chattanooga Campaign, With especial reference to Wisconsin's participation therein. (Map and diagrams.) Wisconsin History Commission: Original Papers, No. 4. [Madison] Wisconsin History Commission, March, 1911. 9 x 6. *Gift.*

GROVER, N. C., and BOLSTER, R. H. Hydrography of Virginia. Geological Series. *Bulletin* No. III, Geological Survey of Virginia. (Maps and Diagrams.) (Blacksburg), Board of Agriculture and Immigration. 1906. 9 x 6. *Gift.*

HURN, ETHEL ALICE. Wisconsin Women in the War Between the States. Wisconsin History Commission: Original Papers No. 6. (Ills.) [Madison] Wisconsin History Commission, May, 1911. 9 x 6. *Gift.*

JAMISON, C. E. Mineral Resources of Wyoming, and the Mining Laws of the State, and of the United States. Bulletin 1–Series B. Cheyenne, S. A. Bristol Co. 1911. 9 x 6. *Gift.*

LANDES, HENRY. The Road Materials of Washington. (Maps.) Bulletin No. 2. Washington Geological Survey. Olympia, Wash., E. L. Boardman, Public Printer. 1911. 9 x 6. *Gift.*

REEDS, CHESTER ALBERT. A Report on the Geological and Mineral Resources of the Arbuckle Mountains, Oklahoma. (Illustrations and maps.) Bulletin No. 3, Oklahoma Geological Survey. Norman. 1910. 9 x 6. *Gift.*

WATSON, THOMAS LEONARD. Mineral Resources of Virginia. (Maps, diagrams and ills.) Virginia Jamestown Exposition Commission, Lynchburg. 1907. 10½ x 7. *Gift.*

——— First Annual Report, State Water Storage Commission. State of Maine. January, 1911. (Maps and ills.) Augusta, Kennebec Journal Print. 1911. 9 x 5½. *Gift.*

——— Topographic and Geological Survey of Pennsylvania. 1906–1908. (Maps, diagrams and ills.) Harrisburg, State Printer. 1908. 9½ x 6. *Gift.*

——— A Preliminary Report on Drainage Reclamation in Georgia. The Drainage Situation in Georgia, by S. W. McCallie, and Drainage Examinations and Surveys in Georgia by U. S. Department of Agriculture. (Ills.) *Bulletin* No. 25, Geological Survey of Georgia. (Atlanta, 1911.) 10 x 6½. *Gift.*

AFRICA

HUNT, ARTHUR S. The Oxyrhynchus Papyri. Part VIII. Edited with translations and notes by ———. With Seven Plates. London, Egypt Exploration Fund. 1911. 10½ x 7½.

ASIA

MEREDITH, FREDERICK CHARLES. (Editor and compiler.) *Iti Dalan Ti Santa Nga Krus* (The Way of the Holy Cross). [This book is the first published in the Ilokono dialect in the sub-province of Bontoc, P. I.] Mission of St. Mary the Virgin, Sagada, P. I. 1911. 6 x 4½. *Gift.*

EUROPE

——— Jahrbuch des Schweizer Alpenclub. XLVI Jahrgang, 1910–1911. (Ills.) Bern, Schweizer Alpenclub. 1911. 10½ x 7½.

——— Klubhütten-Album des Schweizer Alpen-Club. (Beilage zum Jahrbuch S. A. C. Bd. 46.) (Ills.) [Bern] Zentral-Komitee S. A. C. 1911. 7 x 10.